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DIAMETER OF RED BLOOD CELLS OF PREMATURE INFANTS AND OF THOSE BORN AT FULL TERM

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The diameter of the erythrocytes is a factor to which of late years more and more attention has been paid, especially in judging different anemias. Under normal conditions the diameter of the red cells can be changed by various influences, which have been extensively discussed among others by Wintrobe.[1] The most important modifications in size are those resulting from changes in the carbonic acid tension of the blood caused by alterations in the oxygen tension of the atmosphere or by other influences. The importance of this factor also appears from the constant difference in size between the erythrocytes in arterial and in venous blood, a fact on which Hamburger laid great stress years ago. Under pathologic conditions one observes an anisocytosis with, as a rule, a high microcytosis as a rather typical symptom in acholuric jaundice (Gänsslen[2]), and a still more extensive anisocytosis with preponderating megalocytosis in tropical sprue and in pernicious anemia. In judging the effect of modern therapy on the last-mentioned disease, great attention is paid to the disappearance of the megalocytosis (Snapper and du Preez[3]). In aplastic anemia the size of the erythrocytes is not changed. The aforementioned changes in the diameter of the erythrocytes in anemias occur not only in adults but also in children.[4]

For different reasons I wanted to make a closer examination of the size of the erythrocytes during the first weeks of life and to compare those of full-term and premature children, first because after birth the blood is subjected to different factors (e. g., transition from an environment that is poor in oxygen to one rich in oxygen,[5] and thickening of the

1. Wintrobe, M. M.: The Erythrocyte in Man, Medicine **9**:195, 1930.

2. Gänsslen, M.: Die haemolytische Konstitution, Deutsches Arch. f. klin. Med. **146**:25, 1925.

3. Snapper, I., and du Preez, J. D. G.: The Treatment of Pernicious Anemia with Desiccated Hog's Stomach, Arch. Int. Med. **47**:771 (May) 1931.

4. Hampson, A. C., and Warner, E. C.: Anaemia and Liver Therapy in Infancy and Childhood, Arch. Dis. Childhood **5**:299, 1930.

5. Haselhorst, G., and Stromberger, K.: Ueber den Gasgehalt des Nabelschnurblutes, Ztschr. f. Geburtsh. u. Gynäk. **98**:49, 1930. Eastman, J.: Foetal Blood Studies, Bull. Johns Hopkins Hosp. **47**:221, 1930. Goldbloom, A., and Gottlieb, R.: Icterus Neonatorum: III. The Oxygen Capacity and Saturation of the Mother and Foetus, J. Clin. Investigation **9**:139, 1930.

blood by loss of water). In premature infants some of those factors work more intensively than in full-term infants. It is also known that most of these factors are able to change the size of the erythrocytes in a certain way. A priori, then, one may expect that a comparative investigation of the changes in the size of the red cells will also increase insight into the significance of the factors mentioned. Next, there is the question whether such an examination can also teach anything about the velocity of growth of full-term and premature infants. Finally, the determination of the size of the red cells may be regarded as having significance for the calculation of the total surface of the erythrocytes, e. g., for the surface available for the transport of oxygen, and for the judgment of the rate of sedimentation of the blood corpuscles in babies.

At birth the diameter of the erythrocytes of full-term infants and, according to a few investigations, also of premature infants is much greater than the values found in the normal blood of adults. In addition there is anisocytosis. This change in the size of the corpuscles of newborn infants is regarded as a symptom of immaturity. From the literature it is seen that at least in full-term infants the mean diameter does not show any change of importance during the first two weeks of life,[6] a fact which I confirmed. An extensive examination of the size of the erythrocytes in full-term infants after the first two weeks of life has failed, however, to yield significant results; from the available communications it appears only that in full-term infants it takes some months before the degree of anisocytosis approaches that in adults.[7] Concerning the behavior of the cells of premature infants in this respect I could find nothing of importance, except that Lichtenstein [8] stated that in his well known research on the anemia of premature infants he constantly found anisocytosis during the first months of life.

With the permission of the director of the obstetric clinic of the Town University of Amsterdam, Professor van Rooy, and of his assistant in the department for premature infants of this clinic, the pediatrician Dr. Heybroek, I examined the size of the erythrocytes at different times after birth in a large number of premature and full-term infants. In this examination I included only those normal infants who during the first three months of life did not receive any preparation that could eventually affect the composition of the blood. I wanted not only to determine the mean size of a number of erythrocytes, but to obtain an

6. Börner, R.: Das Blut des Menschen mit neueren Methoden untersucht, Arch. f. d. ges. Physiol. **220**:729, 1928.

7. Saragea, T.: Le diamètre des hématies de l'homme aux différents âges de la vie, Compt. rend. Soc. de biol. **86**:312, 1922. Riva, A.: La formula eritrocitrometrica nell' età infantile, Pediatria **39**:351, 1931.

8. Lichtenstein, A.: Hämatologiska studier av för tidigt födda barn, Stockholm, Isaac Marcus' Boktryckeri, 1917.

exact picture of the anisocytosis. Such a picture could be secured only by using the method given by Price-Jones.[9] It is true that this is a time-consuming method, but for simplicity and accuracy it has no equal. By the Price-Jones method, after wiping away the first two drops of blood obtained from a prick in the heel, a thin smear of a drop of blood is made on a slide. After quick drying in air the preparation is always fixed and stained in the same way, according to the combined method of Pappenheim. With a certain microscopic enlargement (1,000) the image is projected and then gone over by means of a Zeiss drawing prism on a sheet of paper, or the cells are outlined with the same enlargement in the microscopic field by means of the drawing apparatus of Abbe. The greatest diameter of these outlined red cells, enlarged exactly 1,000 times, and a diameter taken at an angle of 90 degrees with the former are determined. The mean of these two

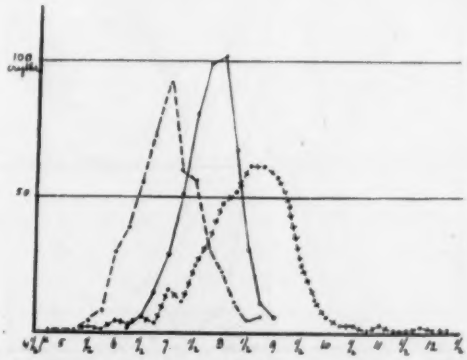

Chart 1.—These curves represent: solid line, a normal child with a degree of anisocytosis of from 6¼ to 9 microns and a mean red cell diameter of 7.77 microns; dash line, a patient suffering from acholuric icterus, with an anisocytosis of from 4¾ to 8¾ microns and a mean diameter of 6.99 microns; cross line, an adult suffering from pernicious anemia, with an anisocytosis of from 5¼ to 12¼ microns and a mean diameter of 8.48 microns.

diameters is taken as the diameter of the cell. According to the Price-Jones method, in each specimen of blood prepared in this way 500 erythrocytes are counted and the values found are expressed in a curve. I consider this the only way to get an exact picture of the red cells, especially of the anisocytosis. Examination of only 100 or 200 cells, or even fewer, gives an inaccurate picture of the real differences in the size of the erythrocytes.

Chart 1 gives the Price-Jones curve of the blood of an older healthy child, of that of a patient suffering from acholuric jaundice and of that

9. Price-Jones, C.: The Variation in the Sizes of Red Blood Cells, Brit. M. J. **2**:1418, 1910.

of an adult suffering from pernicious anemia. The typical changes in the degree of anisocytosis and in the mean diameter in acholuric jaundice and in pernicious anemia, mentioned on the first page of this article, appear clearly in these curves.

The examination of normal children included more than a hundred preparations from thirty-two premature infants and more than fifty preparations from full-term infants, from 1 day to 21 weeks old. With two exceptions, the weight of the premature infants at birth was less than 2,000 Gm. The results of the investigations are presented in a number of curves and tables. These curves are mean curves, each one made from a number of Price-Jones curves of full-term and premature infants during the same week of life. In each case I have mentioned the number of children on which the mean curve was based and the

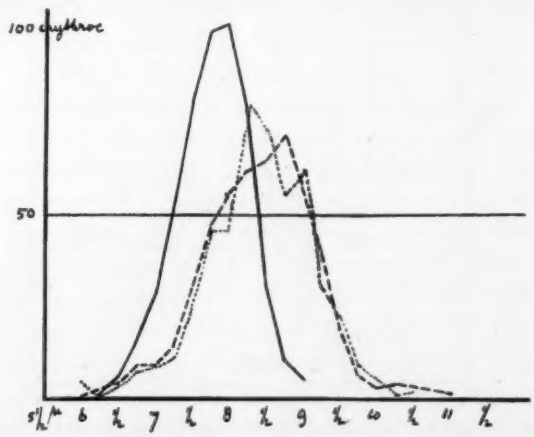

Chart 2.—These curves represent: solid line, a full term child, aged 8 weeks, with a mean red cell diameter of 7.7655 microns; dash line, another full-term child, aged 14 hours, with a mean diameter of 8.4125 microns; dotted line, a premature infant, aged 1 day, with a mean diameter of 8.4015 microns.

mean size of the red cells for that week of life. A comparison of the mean curves of premature and full-term infants during the first week of life (chart 3) shows that directly after birth no difference exists, and that in both groups the mean diameter of the red cells is greater than in adults. Further, it appears that the degree of anisocytosis, which according to the literature and my own experience, is from 6 to 9 microns in adults and older children, is much larger in premature and full-term children, and that during this week especially the number of macrocytes is increased. As these curves have each been composed from six others, it seems as though in the first week of life no cells smaller than 5¾ microns or larger than 10.5 microns are present; in reality in full-term as well as in premature children among the 500 examined

cells there were always some that were smaller or larger. This was striking in those rare cases in which the blood could be examined on the first day of life.[10] In infants who had been born during narcosis of the mother the curve remained irregular during the first days of life, but these children were not included in the investigation as they could not be said to be in a normal condition.

The smallest cell found in premature and in full-term infants measured 4.5 microns; the largest, 11.5 microns; each time only 1 or 2 of 500 cells had this diameter. The curves found during the first twenty-four hours of life in some premature and full-term infants showed great analogy to those obtained during a remission in cases of pernicious anemia; that is, the mean diameter of the erythrocytes was

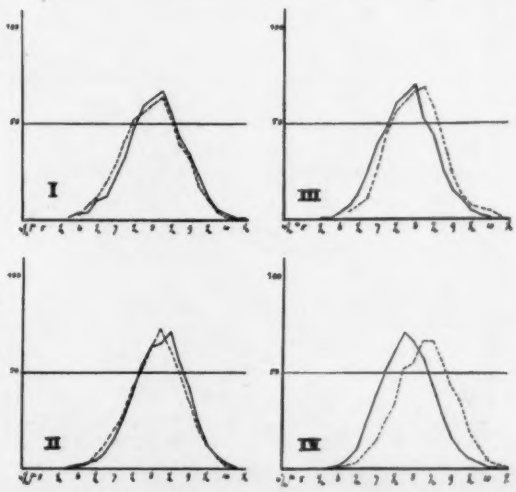

Chart 3.—*I*, curves for the first week of life: dash line, six full-term infants with a mean red cell diameter of 7.988 microns; solid line, six premature infants with a mean diameter of 8.0842 microns. *II*, curves for the second week: dash line, seven full-term infants with a mean diameter of 8.159 microns; solid line, six premature infants, with a mean diameter of 8.1406 microns; *III*, curves for the third week: dash line, five full-term infants with a mean diameter of 8.2432 microns; solid line, seven premature infants with a mean diameter of 7,818 microns; *IV*, curves for the fourth week: dash line, six full-term infants, with a mean diameter of 8.266 microns; solid line, ten premature infants with a mean diameter of 7.9129 microns.

much larger than normal, and the curve was irregular, with a wide base (chart 2). However, no cells of very great diameter[11] (from 12

10. Silvette, H.: A Study of Erythrocyte Diameters in the Newborn, J. Lab. & Clin. Med. **13**:245, 1928.

11. Silvette (footnote 10). Heissen and Schelloer: Ueber die Grössenverhältnisse der roten Blutkörperchen beim Neugeborenen und Säugling, Ztschr. f. Kinderh. **46**:105, 1928.

to 16 microns) were found, such as may be seen in pernicious anemia, in erythroblastosis in general (see description at the end of this article) and during fetal life until the sixth month of pregnancy (Knoll [12]).

The mean Price-Jones curves for the second week in full-term and premature children show only a slight difference from those of the first week; in both the mean diameter of the red cells has somewhat increased.

During the third week the mean curve for the premature infants begins to become distinct from that of the full-term children, and this separation becomes still clearer during the following weeks. In comparison with the preceding week the mean diameter of the erythrocytes

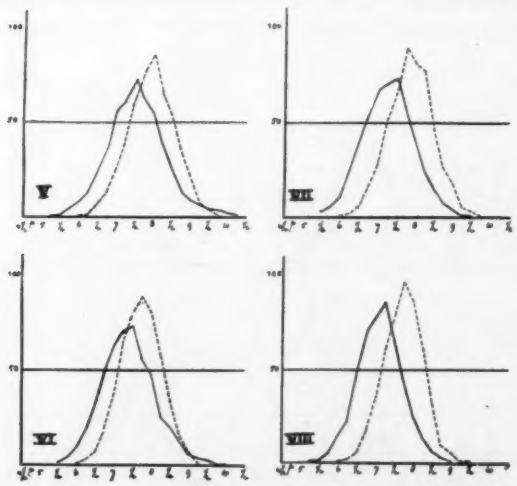

Chart 4.—*V*, curves for the fifth week of life: dash line, six full-term infants with a mean red cell diameter of 7.9449 microns; solid line, ten premature infants with a mean diameter of 7.5086 microns. *VI*, curves for the sixth week: dash line, six full-term infants with a mean diameter of 7.7208 microns; solid line, seven premature infants with a mean diameter of 7.5473 microns. *VII*, curves for the seventh week: dash line, five full-term infants with a mean diameter of 7.8583 microns; solid line, eight premature infants with a mean diameter of 7.3045 microns. *VIII*, curves for the eighth week: dash line, five full-term infants with a mean diameter of 7.7262 microns; solid line, nine premature infants with a mean diameter of 7.0974 microns.

in premature children has somewhat decreased, whereas that of full-term children has increased.

During the fourth week the curves of premature and full-term children separate still more distinctly, and the mean diameter of both remains about the same.

12. Knoll, W.: Untersuchungen über embryonale Blutbildung beim Menschen, Ztschr. f. mikr.-anat. Forsch. **18**:199, 1929.

During the fifth week of life (chart 4) the Price-Jones curve of the full-term children becomes smaller at the base and steeper, and the mean diameter of the red cells decreases. Considering only the full-term children, one can say that from the sixth week on the peak of the mean curve is higher each week than during the preceding week. The diameter of the erythrocytes of the full-term infants remains about the same from the sixth week on, and the type of the curve approaches more and more that of older children and of adults.

In premature infants the mean diameter of the red cells is smaller during the fifth week of life than during the fourth week, but the base of the curve is much wider than in full-term children, and the peak is not higher than during the preceding weeks. The curve for the sixth week shows little difference from that for the preceding week. In the

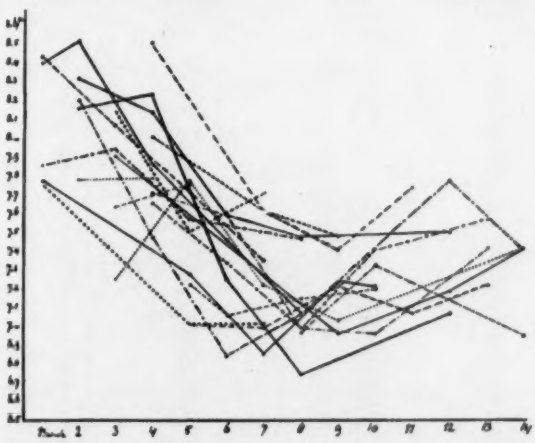

Chart 5.—Changes in the size of the red blood cells, after the first few weeks of life, in a number of premature infants, each represented by a line.

seventh week the curve shifts still more to the left, because the number of large erythrocytes has decreased. This decrease in the diameter continues during the eighth week, and though the degree of anisocytosis still runs from 5.25 to 9 microns, the peak of the curve is higher than during the preceding weeks. In the eighth week the mean diameter of the red cells in premature infants is smallest. The comparative curves of full-term and premature infants are given for only the first eight weeks of life, because those of full-term children show nothing in particular after this period. The results of examination during the eighth to the twenty-first week of life in premature infants are presented in table 1.

After the eighth week the Price-Jones curve for premature infants slowly develops a smaller base, but for several weeks the base remains

wider than that for full-term children. During the ninth and tenth weeks a slow increase in the mean diameter of the red cells of premature infants can be observed, accompanied in the tenth week by a higher peak. During the eleventh week the peak becomes somewhat lower, but the mean diameter has risen. Then the mean size decreases again, and till the fifteenth week it oscillates around 7.5 microns, a value somewhat lower than that for full-term children of the same age. I must add that, from the fourteenth week on, several of the premature infants examined were given a preparation to accelerate their recovery

TABLE 1.—*Red Blood Cells in Premature Infants from Eight to Twenty-One Weeks Old*

Week of Life, Full-term	Number of Erythrocytes at Peak of Curve	Mean Degree of Anisocytosis	Peak of Curve, Microns	Mean of Determinations	Mean Diameter, Microns
1	63	6 - 10¼	8¼	6	7.988
2	73	6 - 10¼	8¼	7	8.159
3	69	6½ - 10¼	8½	5	8.243
4	67	6 - 10½	8¼	6	8.266
5	85	6 - 9¾	8	6	7.945
6	88	6 - 9¼	7¾	6	7.721
7	88	6 - 9¾	7¾	5	7.858
8	96	6 - 9½	7¾	5	7.726
Premature					
1	64	5¾ - 10½	8¼	6	8.084
2	71	5¾ - 10¼	8½	6	8.141
3	70	5½ - 10	8	6	7.818
4	71	5¾ - 10¼	7¾	10	7.913
5	71	5¼ - 10¼	7½	10	7.509
6	73	5½ - 10	7½	7	7.547
7	73	5½ - 9½	7½	8	7.305
8	85	5¼ - 9	7¼	9	7.097
9	80	5½ - 9	7¼	6	7.213
10	91	5¼ - 9	7¼	6	7.293
11	78	5¾ - 9¾	7¾	5	7.835
12	78	5¾ - 9¾	7½	6	7.569
13	86	5¾ - 9¾	7½	4	7.600
14	82	5½ - 9¾	7¼	3	7.404
15	87	5¾ - 9½	8	1	
16	75	5½ - 9¼	7¾	2	
17	74	5¾ - 9¾	7¾	2	
18	72	5½ - 9¼	7½	2	
19	76	6 - 9¾	7¾	1	
20	85	5¾ - 9¼	7½	1	

from anemia. Premature children were observed until the twenty-first week of life. It is my impression that between the eighteenth and the twentieth week the curve for the premature infants shows the greatest analogy to that for full-term infants of the same age. After the fourteenth week, however, I could examine only a small number of premature infants.

I have combined the changes in the mean size of the red cells of a number of premature infants for different weeks into a diagram (chart 5), in which each child is represented by a line. More clearly than from the curves just mentioned, which are mean curves, this diagram shows the decrease of the mean diameter in premature infants after the first few weeks of life. Between the sixth and the tenth week

the diameter is smallest; then follows a slow increase. Later oscillations in diameter still occur, but with a single exception they are very small.

Before entering further into the significance of the changes found, I want to point out the summary in table 1. I have given here the extreme limits of the mean Price-Jones curves for each week of life in premature and full-term infants, in other words, the degree of anisocytosis, each curve having been made on the basis of 500 cells. To the right of the column giving the limits, I have expressed the peak of the curve in microns, and to the left the number of cells forming the peak. Also from this table the following facts appear:

1. In full-term infants the peak remains at about the same level during the first four weeks of life; after that time there is only a

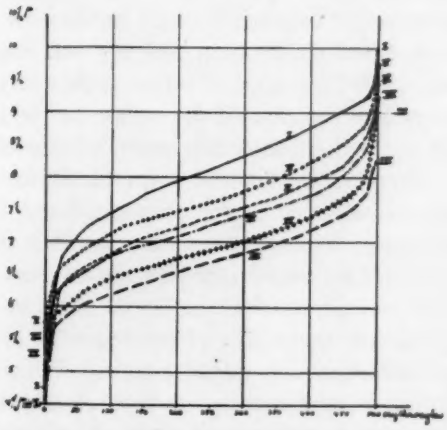

Chart 6.—Increase of diameter of the red blood cells in a premature infant during different weeks of life. *I*, second week; *II*, fourth week; *III*, sixth week; *IV*, eighth week; *V*, twelfth week; *VI*, fourteenth week.

slight decrease in the mean diameter, whereas the peak rises somewhat higher. Cells smaller than 6 microns do not occur, and after the fifth week of life there are no cells present larger than 9.75 microns.

2. The changes in premature infants differ in many respects from those in full-term infants; these differences have already been explained.

Table 1 also contains the results in premature infants from the ninth to the twentieth week of life. The number of curves from which the mean curve is composed is also mentioned, as well as the mean diameter of the erythrocytes for each week.

In a special curve (chart 6) I have noted the oscillations in the diameter of the erythrocytes during different weeks of life in a premature infant with a weight of 1,070 Gm. at birth. This is another kind of

curve, in which the 500 cells have been arranged according to their increasing diameters. In the beginning (*I*) the mean size of the red cells is largest and the base of the curve is widest. In the fourth week (*II*), one sees clearly a decrease in the diameter of the cells, which is strongest in the sixth week (*III*); here the very large erythrocytes are disappearing. Curve *III* reaches only to 8¼ microns, but begins at 4½ microns. Curve *IV* lies somewhat higher than *III*; *V* and *VI* (the twelfth and fourteenth weeks) lie between the extreme values, and so at a more normal level; only a few small cells and some large ones are still present.

COMMENT

The results obtained give rise to the following comment. As is well known, the nonnucleated erythrocytes of the fetus have a much larger diameter than those of the adult. The size of the red cells of a fetus of from 4 to 6 months lies between 8 and 9 microns or still higher. In analogy with the observations in many animals one may expect that in premature infants, in whom fetal life has been cut short, the mean diameter of the erythrocytes should be much larger at birth than in full-term children. Further, this difference in size should disappear during the first few months of life. I found, however, that directly after birth the Price-Jones curves for premature and full-term infants showed little difference; in both the mean diameter was much larger than at any time later. I further saw that the curves in both kinds of children showed the same type of immaturity. Also during later weeks of life the changes in the mean size of the red cells of premature children are contrary to what one might expect. Whereas in full-term children the mean size and the curve as a whole reach those of older children soon after birth, namely, in about six to eight weeks, the mean size of the erythrocytes in premature children in the beginning decreases to a value that is much lower than that for full-term children of the same age, and the base of the curve remains wide for a long time.

At the beginning of the examination I thought that in following the changes in mean diameter and in degree of anisocytosis of red cells in full-term and premature children after birth, I should be able to compare the velocity of growth of the two groups of children. I was of the opinion that the age at which a Price-Jones curve of a mean diameter and type analogous to those in older children and adults was obtained could serve as a basis for comparison. As far as the mean diameter was concerned, this comparison proved impossible, and as to the time that premature children show the same type of curve as normal children, I cannot make an irrefutable statement for several reasons. In any case the curves are not the same before the premature child is from 18 to 20 weeks old. The time for observation of the pre-

mature children older than 3 months was, as a rule, too short; after 3 or, at most, 4 months of age premature children are discharged from the hospital. Further, after the third month of life most premature children are given some iron preparation to accelerate recovery from their physiologic anemia. It cannot be denied that the administration of such a preparation also has an influence on the Price-Jones curve.

The results of this investigation suggest the question whether any relation exists between the changes found and other processes that take place in the blood after birth. I mean more especially those which give rise to icterus neonatorum and the physiologic anemia of premature infants and those processes which are connected with the physiologic loss of weight after birth.

Directly after birth premature as well as full-term infants have a polycythemia with a high content of hemoglobin. Now it may be accepted that after birth a strong hemolysis takes place, and that this hemolysis is much stronger and lasts much longer in premature than in full-term infants. In a recent investigation of the prophylaxis of the anemia of premature infants with Dr. Heybroek I was able to confirm this once more.[13] In full-term children the content of bile substances of the blood after the second week nearly always decreased to the normal value; in premature infants the increase continued for a longer time, and the decrease of the number of erythrocytes after birth continued as long as the content of bile substances in the blood was increased (see table 2, in which the content of bile substances is expressed by the icteric index). In modern researches on icterus neonatorum[14] a far-reaching relation is accepted between this strong hemolysis and the transition from an environment with a very low to an environment with a very high oxygen tension, the transition which occurs at birth. The large number of erythrocytes, with a high hemoglobin content of the fetal blood, is regarded as an "acclimatization phenomenon" due to the low oxygen tension. The postnatal destruction of red cells and the accompanying hemolysis are then regarded as a regulatory process, which causes the disappearance of the difference between the new abundant supply and the need of oxygen. In premature infants this stimulation caused by the increased oxygen supply at birth and its consequences is stronger because the need of oxygen is much smaller and the stimulation lasts for a longer time. Of course, one must not forget the factor of the immaturity of the liver, which

13. van Creveld, S., and Heybroek, N. T.: Data to be published elsewhere.

14. Goldbloom, A., and Gottlieb, R.: Icterus Neonatorum, Am. J. Dis. Child. **38**:57 (July) 1929; The Nature of Icterus Neonatorum, New York State J. Med. **30**:1219, 1930; The Production of Icterus in Animals Following Prolonged Anoxaemia, J. Clin. Investigation **8**:375, 1930. Anselmino, J. K., and Hoffmann, F.: Die Ursachen des Icterus neonatorum, Klin. Wchnschr. **10**:97, 1931.

in premature infants also cooperates in order that the content of bile substances of the blood remains increased for a longer time.

However, when analogous changes in the oxygen supply of the organism occur at a later age, changes not only in the number of erythrocytes but also in the size of these cells have been established. A decrease of the oxygen supply (climate of the mountains or experimental decrease of the atmospheric pressure) or of the power to take up oxygen (as in emphysema) leads to an increase of the mean diameter of the erythrocytes; the mean is increased also because many young cells with a large diameter then come into the circulation.[15] An increased supply of oxygen (indirectly, e. g., by hyperventilation [16]) causes a decrease in the mean diameter of the erythrocytes, even if the increase in the supply of oxygen and its consequences are not so strong and do not last so long as at birth. Under such circumstances the hemolytic action in itself also gives rise to a decrease in the diameter of the erythrocytes.

This increased supply of oxygen really plays an important rôle after birth in premature infants, in whom it causes greater blood destruction and also a more distinct decrease in the mean diameter of the erythrocytes.

Directly after birth another complicating factor exists, which lasts in full-term children, as a rule, till about the end of the second week, and in premature infants frequently longer. This is the physiologic loss of weight; parallel to the loss of weight there occurs an increase in the viscosity of the blood, caused by loss of water. This anhydremia in itself causes an increase in the diameter of the red cells.[17] The combination of both factors is in my opinion the cause of the fact that the Price-Jones curves of premature and full-term children show little difference during the first weeks of life. It is true that in premature infants the stimulation of the increased oxygen supply is stronger, but, contrary to this, is the relatively greater significance of loss of weight in premature infants. After the first two weeks the symptoms of intensified hemolysis in full-term children have, as a rule, disappeared, and no anemia of any significance occurs. In premature infants the stimulation of the increased supply of oxygen lasts for a longer time and has a strong influence on the blood; in my experience this cannot

15. Barcroft, J.: Medical Aspects of Life at High Altitudes, Proc. Roy. Soc. Med. (Sect. Med.) **16**:57, 1923. Seyfarth, C.: Ueber die Blutveränderungen bei Luftdruckerniedrigung (Hohenklima), Klin. Wchnschr. **6**:487, 1927. Price-Jones, C.: The Size of Red Blood Cells in Emphysema, J. Path. & Bact. **24**:326, 1921.

16. Wiechmann, E., and Schurmeyer, A.: Untersuchungen über den Durchmesser der roten Blutkörperchen, Deutsches Arch. f. klin. Med. **146**:374, 1925.

17. Saragea, T.: Le diamètre globulaire pendant la privation d'eau, Compt. rend. Soc. de biol. **87**:623, 1922.

be prevented by medication. Parallel to this, the Price-Jones curve of the premature infants after the second week deviates from that of full-term children; the erythrocytes in general become smaller.

About the ninth week a change takes place; then, as a rule, the maximum anemia of premature infants has been reached. By this anemia, with its small number of erythrocytes and low hemoglobin content, the possibility of a further influence of an increased supply of oxygen is excluded. About this time, often somewhat earlier, the percentage of reticulocytes, which has increased since birth, increases

TABLE 2.—*Changes in the Number of Erythrocytes, the Hemoglobin Content and the Icteric Index in a Group of Premature Children*

Age, Weeks	Erythrocytes	Hemoglobin (Sahli)	Icteric Index	Age, Weeks	Erythrocytes	Hemoglobin (Sahli)	Icteric Index
7	4,300,000	50	50	4½	4,840,000	65	±100
9	3,680,000	45	60	6	3,890,000	55	± 70
10	3,260,000	40	50	8½	3,790,000	50	100
12	3,410,000	35	17	11	3,540,000	45	25
15	3,450,000	30	12	13	4,110,000	46	6
17	3,390,000	30	10	14½	4,510,000	48	8
19	2,868,000	27	2	16½	5,550,000	60	3
Therapy: 600 mg. reduced iron				Spontaneous recovery from the anemia			
21	4,128,000	50	4				
23	6,170,000	60	5				

TABLE 3.—*Reticulocytes in Premature Children*

Week	Number of Determinations	Mean Percentage
1	5	2.5
2	3	1.54
3	4	1.5
4	3	0.7
5	2	0.75
6	1	2.2
7	3	3.35
8	2	3.3
9	6	4.4
10	0	...
11	4	3
12	4	4.55
13	3	4.25

to a rather high degree. This appears from table 3, reproduced from the previously mentioned publication by Dr. Heybroek and myself.[13] These young cells are at the same time also the larger cells, which contribute to the increase of the mean size after the eighth week of life. I am of the opinion that this increase in the granulated red cells is not in accordance with the conception of the anemia of premature infants as a pure aplastic anemia. Moreover, the Price-Jones curves that were found in this examination during the anemia and just before this stage, in their relatively wide degree of anisocytosis, deviate from the curves obtained in cases of real aplastic anemia.

Icterus neonatorum has been looked on more and more as a hemolytic jaundice, and several arguments for this theory have been

advanced. In hemolytic anemia in full-term children no changes in the size of the erythrocytes have been found, e. g., no decrease in their mean diameter. In premature infants, in whom the jaundice as a rule is more severe and lasts longer, changes in size can be found after the first two weeks of life until the symptoms of hemolysis have disappeared.

In full-term children a degree of anisocytosis resembling the physiologic anisocytosis of older children and adults is reached much earlier than in premature children. The anisocytosis of premature infants is, however, restricted to certain limits. Considering the much more important changes in the blood of premature infants during the first months of life (the development of anemia and the recovery from this condition), it is no wonder that the anisocytosis lasts longer in these children, who give a greater reaction to all kinds of stimulation than full-term children do. Some analogies have also been found in adults in different anemias with widely divergent influences on the mean diameter of the red cells. In pernicious anemia as well as in hemolytic jaundice, for example, one notes the characteristic symptom of a greater difference in the sizes of the individual cells than in normal persons.

The following examples are given to illustrate how the determination and the continuation of the Price-Jones curves and of the mean diameter of the red cells during the early postnatal period of life may contribute to the analysis of anemias. I have especially in view some anemias that occur shortly after birth, in which, as concerns the formation of blood, one may speak either of a return to, or the persistence of, the fetal level (fetal erythroblastosis), or of a weak development of the erythropoietic system. On the one hand this applies to the anemia in icterus neonatorum gravis and the rare cases described as instances of pernicious anemia in sucklings (Hampson and Warner [4]), and on the other hand, probably to the cases of congenital anemia [18] which are being described more frequently.

In 3 cases of icterus neonatorum gravis observed in the department of premature infants the blood was examined in three different stages of the illness. In the first case, on the third day of life the child was lemon yellow and anemic to a high degree; the blood count showed 21 normoblasts to 100 leukocytes. The Price-Jones curves of the blood smear on this day had a course (chart 7) analogous to the embryonal blood formation that undoubtedly took place at this stage of the disease; the mean diameter of the erythrocytes was fairly large, 9.215 microns. No small cells (less than 7 microns) were present in this smear, but there were many large cells, one (in 500) with a diameter of 16 microns.

18. Pasachoff, H. D., and Wilson, L.: Congenital Anemia of the New-Born; Necropsy and a Review of the Literature, Am. J. Dis. Child. **42**:111 (July) 1931.

When this patient was 18 days old, the icterus had nearly disappeared; in the blood only 2 normoblasts to 300 leukocytes could be found. The hemoglobin content was low (Sahli 22); the cells showed no poikilocytosis or anisocytosis. According to these facts the Price-Jones curves were normal, which in this case pointed with great probability to an aplastic condition. At the age of 53 days, when the hemoglobin content had fallen to 12, a relatively large number of normoblasts were again found in the blood smear, just as is sometimes, and transitorily, the case in aplastic anemia, probably as a result of a last effort of the bone marrow at regeneration. An analogous conclusion could be drawn in the case described, from the Price-Jones curves with the large cells at the right. Soon after this examination the child died.

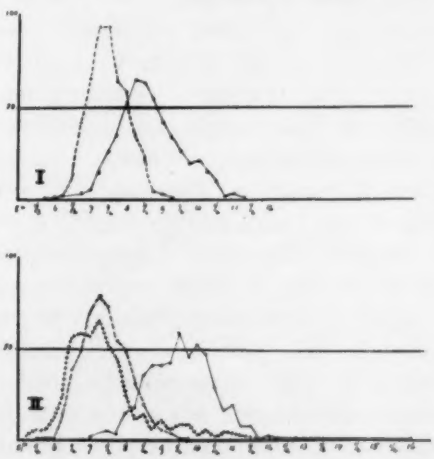

Chart 7.—*I*, curves in congenital anemia: solid line, an infant aged 14 days, with a degree of anisocytosis of from 6 to 11¼ microns and a mean red cell diameter of 8.655 microns; dash line, the same infant 4½ months old with an anisocytosis of from 5¾ to 9¼ microns and a mean diameter of 7.505 microns. *II*, curves in icterus neonatorum gravis: solid line, an infant, 3 days old, with an anisocytosis of from 7 to 16 microns and a mean diameter of 9.215 microns; dash line, the same infant, 18 days old, with an anisocytosis of from 5½ to 9¾ microns and a mean diameter of 7.431 microns; cross line, the same infant, 53 days old, with an anisocytosis of from 5¾ to 12¼ microns and a mean diameter of 7.212 microns.

I stress the absence of small cells during the first days of icterus neonatorum gravis, corresponding to the conception of the disease as a fetal erythroblastosis;[19] this was also noted in two other cases of icterus during the first days of life. In one of these cases with a typical familial anamnesis, the blood was examined on the second day of life

19. Bührman, W. L., and Sanford, H. N.: Is Familial Jaundice of New-Born Infants Erythroblastosis? Am. J. Dis. Child. **41**:225 (Feb.) 1931.

and the very large ratio of 288 erythroblasts to 100 leukocytes was found; the mean diameter of the nonnucleated erythrocytes was 10.024 microns, and the degree of anisocytosis ranged from 7.25 to 13 microns. The disease had a rapid course; an intense anemia developed, and in the meantime the erythroblasts practically disappeared from the blood (on the eighth day of life only 3 erythroblasts to 100 leukocytes were counted; on the same day the mean diameter of the nonnucleated erythrocytes was 9.8365 microns, and there were no cells with a diameter below 7 microns). Shortly before death (on the eleventh day), when the icterus was still intense, erythroblasts appeared in the blood in greater number (32 to 100 leukocytes); the mean diameter of the nonnucleated cells was 9.19 microns, and again there were no cells with a diameter below 7 microns.

Two Price-Jones curves are given for a case of congenital anemia. On its fifth day of life a child was brought to the department of premature infants because, without a preceding jaundice or hemorrhage, it suddenly became alarmingly pale (Sahli 45). In the blood only slight signs of regeneration were present. On the fourteenth day of life the number of granulated erythrocytes was 1:1,000, and the number of erythrocytes, 3,200,000; only 3 normoblasts to 200 leukocytes were counted. The Price-Jones curve (chart 7) showed little resemblance to the one found in erythroblastosis, but indicated more a weakness of the erythropoietic system. It was a regular curve with a somewhat wide base, that is, showing moderate anisocytosis, but without abnormally large or abnormally small cells, and with a mean diameter of the red cells that was only a little increased, considering the age of the child. At 4½ months, when the hemoglobin content was 71, the number of erythrocytes was normal and the nucleated erythrocytes were totally absent, a Price-Jones curve was obtained which was normal for that age.

I shall restrict myself to these few examples, which indicate the clinical significance of an analysis of the Price-Jones curves in early childhood.

SUMMARY

By means of the method of Price-Jones the changes in the size of the erythrocytes during the first months after birth were investigated in a large number of full-term and premature infants. One of the chief reasons for this study was the fact that directly after birth the blood is influenced by different factors which in themselves are able to change the size of the erythrocytes in a definite way. These factors do not act with the same intensity in full-term as in premature children. During the first two weeks after birth the Price-Jones curves of full-term and premature infants showed little difference. Whereas

after that period the mean diameter in full-term children did not change very much, that in premature children decreased considerably; also the curve showed a different course from that in full-term children. The significance of the established differences and their relation to the newer conceptions of the cause of hemolysis after birth, to the anemia in premature children and to the physiologic loss of weight after birth are discussed in extenso.

The clinical significance of the anisocytosis and of the mean diameter of the erythrocytes in the analysis of anemias in the early months of life is explained by means of some examples (cases of icterus neonatorum gravis and congenital anemia).

CONGENITAL SYPHILIS

RESULTS OF EARLY TREATMENT

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Three years before this writing, one of us (E. D. A.[1]) in a preliminary report on this subject attempted to prove, by comparisons of weight, the value of early treatment in babies born of mothers believed to be syphilitic. Since the completion of that first report an additional number of patients have been treated and followed up for periods of from four months to over four years. Our present results tend to bear out our former contention, namely, that immediate postnatal treatment of all babies born of syphilitic mothers who have had little or no prenatal antisyphilitic treatment themselves results, in the great majority of cases, not only in a serologic cure but in apparently a normal and healthy child.

Our main interest since the beginning has been in those babies whose mothers have the disease in what is considered a latent form and who, at birth and perhaps for some weeks after birth, show no signs of congenital syphilis even in x-ray pictures of the bones. In about 50 per cent of these infants, according to some statistics, stigmas of the disease develop at some future date. The rest escape the infection. These patients do not, as a rule, receive treatment because of a negative Wassermann reaction of the cord blood and apparent normalcy at birth. As no one can tell which of these infants are and which are not infected in the first few weeks of life, we have taken the stand of those who believe that all these babies have potential congenital syphilis and, therefore, that all should be treated from birth on. To wait for six weeks or more to see which ones are going to escape is unfair and unscientific in our opinion, as it is well known that once symptoms become evident the disease is a very difficult one to cure, if such a term can be used at all when applied to congenital syphilis.

REVIEW OF THE LITERATURE

The literature is full of articles on the subject of prenatal syphilis and its treatment, but only a few of the more recent papers had refer-

1. Atlee, E. D.: Atlantic M. J. **31**:302 (Feb.) 1928.

ence to the postnatal treatment of the potentially congenital syphilitic child. McCord's [2] extensive work on the former subject is well known to all those interested in this subject. He believes that all babies born with positive Wassermann reactions of the cord blood are syphilitic and should be treated. The same author also made the statement that about 93 per cent of the cases showing positive reactions of the cord blood without treatment end disastrously. Erich Müller,[3] in a paper on the treatment of congenital syphilis, stated:

> If children are treated during the first year of life, the prognosis is excellent. It is not quite so good if they are permitted to go on to the second year without treatment. After the third year it is very hard to reduce the positive serologic reaction. If treatment in the first year is energetic no recurrences or negative serologic reactions and no tertiary symptoms appear. The question as to whether children whose mothers have been treated during gestation should be treated is hard to answer. If infection occurred many years before and treatment during pregnancy has been adequate, one can wait and observe the child. If the mother has been infected shortly before or after conception, the *child* should be treated even if no symptoms are manifest.

Convelaire,[4] in an article on the prophylaxis of congenital syphilis, advocated "treatment of the mother during pregnancy and of the child from birth onward."

Eric Hoffmann,[5] in an article on congenital syphilis, made the following statements:

> Infants born of syphilitic mothers should receive treatment even if they do not show manifest signs of syphilis, as it is very difficult to demonstrate syphilis immediately after birth and up until the sixth week of age. These children can generally be cured by energetic treatment immediately after birth, but cure is much more difficult after the syphilis has become manifest.

U. J. Wile and Joseph Shaw,[6] in a recent article in *The Journal of the American Medical Association,* stated: "Regardless of the absence of clinical or serologic observation it seems wise to treat babies born of mothers in whom the syphilis is early, to supplement the prenatal treatment of the mother." They gave 66 new-born babies a course of six injections of neoarsphenamine and then followed them for periods varying from one to five years. They found 52 of these still living and in good health at the time of writing. Eight were lost track of after the second month and only one was known to have died of syphilis.

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2. McCord, J. R.: Am. J. Syph. **12**:181 (July) 1928.
3. Müller, Erich. Therap. d. Gegenw. **69**:69, 1928.
4. Convelaire, A.: Rev. internat. de l'enf. **9**:500, 1930.
5. Hoffmann, Eric: Monatschr. f. Geburtsh. u. Gynäk. **84**:122, 1930.
6. Wile, U. J., and Shaw, J. W.: The Prenatal Treatment of Syphilis, J. A. M. A. **95**:1791 (Dec. 13) 1930.

David Nabarro [7] believes that a child with a positive Wassermann reaction without other indications of the infection should be given energetic treatment.

METHOD OF TREATMENT

At the present time we are treating all babies born of mothers who have syphilis and who have had inadequate prenatal treatment. Our method of treatment is not entirely original, as the course of injections is based on the one outlined by Sherwood [8] a number of years before this writing. In regard to the amount of treatment, we prefer to take a middle stand between those, such as Wile and Shaw,[6] who employ a minimum amount of treatment and those who advise more or less continuous treatment during the whole first year. Our course of treatment consists of fourteen injections started immediately after birth and continued at weekly intervals until the fourteenth week. Rest for four weeks is followed by an examination of the blood. The drugs used are bismuth and arsenic, the former in the water-soluble form, bismuth sodium tartrate, and the latter as sulpharsphenamine. Four injections of bismuth are followed by six injections of sulpharsphenamine, and the course is complete with four more injections of bismuth. The doses used are as follows:

First injection, bismuth, 5 minims (3.75 mg. of metallic bismuth).
Second injection, bismuth, 6 minims.
Third injection, bismuth, 7 minims.
Fourth injection, bismuth, 8 minims.
Fifth injection, sulpharsphenamine, 0.05 Gm. in 0.5 cc. of water.
Sixth injection, sulpharsphenamine, 0.1 Gm. in 1 cc. of water.
Seventh injection, sulpharsphenamine, 0.1 Gm. in 1 cc. of water.
Eighth injection, sulpharsphenamine, 0.1 Gm. in 1 cc. of water.
Ninth injection, sulpharsphenamine, 0.1 Gm. in 1 cc. of water.
Tenth injection, sulpharsphenamine, 0.1 Gm. in 1 cc. of water.
Eleventh injection, bismuth, 9 minims.
Twelfth injection, bismuth, 10 minims.
Thirteenth injection, bismuth, 11 minims.
Fourteenth injection, bismuth, 12 minims (9 mg. of metallic bismuth).

These doses are varied somewhat according to the weight of the babies.

If the first test of the blood is negative, no more treatment is given, but the blood is examined at three or six month intervals for several years. If the first examination gives positive results we plan to repeat the original course often enough to bring about not only a serologic but a clinical cure. Up until the present time, however, we have not

7. Nabarro, David: Health and Empire **5**:183, 1930.
8. Sherwood, Harry: New York State J. Med. **26**:550 (June 15) 1926.

had one patient who has come regularly for treatment and who has shown clinical or serologic signs of syphilis as long as he was under observation.

Those babies showing an idiosyncrasy to arsenic are given fourteen injections of bismuth.

No attempt is made to examine the urine during treatment. Occasional indurated areas appear after the injections, but we have had no abscesses since we stopped using neoarsphenamine three years before this paper was written. The injections are all given intramuscularly in the buttock with a three-quarter inch, 24 gage needle, on a 2 cc. all-glass Luer syringe. Blood for the Wassermann test is taken from the veins of the arm, using a 24 gage needle on a 5 cc. eccentric tip syringe.

RESULTS OF TREATMENT

A little over five years before this writing we established our special clinic for treating and looking after these patients with congenital syphilis. Up to Sept. 1, 1931, 351 babies were considered fit subjects to be followed in this clinic. Most of these patients received some treatment and then were lost track of. A few died and still fewer escaped treatment because of oversight, but were followed up and examined at a later date. The following are the exact figures: Three hundred and fifty-one infants were picked out at birth to be observed and treated in our special clinic; 271 infants received some treatment, but did not complete one full course of injections; 75 completed at least one course; 5 received no treatment, due to oversight, but were followed up later; 12 are known to have died during their first few months of life; 17 are under treatment at present; 107 babies, which number includes some of each of groups 2, 3, 4 and 5, have been carefully followed up for varying lengths of time, and the following reports are based on these.

One hundred and seven babies whose mothers were considered syphilitic were followed in our clinic for periods varying from four months to four and one-half years. Most of these patients received some treatment. Of those who were not treated, in some it was because the mothers were considered adequately treated during pregnancy, and in others because of lack of cooperation on the mothers' part. Table 1 shows a statistical report of all cases, divided into groups according to whether or not the mother received treatment or whether or not the baby received treatment with subsequent tests of the blood as a check.

The following is a detailed analysis of each of the 8 cases showing positive Wassermann reactions after treatment or during the first year.

CASE 1.—The second child of a 21 year old white woman was born at term. The Wassermann reaction of the cord blood was 2+; the Kahn test was negative. Eight treatments were given during the last two months of pregnancy. The baby was not treated. The Wassermann reaction of the blood was 4+ at 5 months. The case was lost.

CASE 2.—The first child of a 20 year old colored woman was premature. The Wassermann reaction of the cord blood was 4+. No prenatal treatment was given. The baby was not treated. The Wassermann reaction was 3+ at 14 months. Definite syphilis was present.

CASE 3.—The first child of a 22 year old colored woman was premature (?). The Wassermann reaction of the cord blood was negative. Four prenatal treatments were given. The baby was not treated. The Wassermann reaction was 4+ at 8 months.

TABLE 1.—*Statistical Report of All Cases* *

				Subsequent Wassermann Reactions of Blood
107 cases followed	Mothers received 8 or more prenatal injections..... 26 cases	Received 14 or more treatments..... 12	Negative...	12
			Positive....	0
		Received less than 14 treatments..... 14	Negative...	12
			Positive....	2
	Mothers received less than 8 prenatal injections..... 81 cases	Received 14 or more treatments..... 43	Negative...	41
			No report..	1
			Positive....	1†
		Received less than 14 treatments..... 38	Negative...	33‡
			Positive....	5§

* Some of those mothers reported as receiving no prenatal treatments may have received some treatment but, as no records could be found, it was assumed that they had never reported to our special skin clinic.

† Treatment very irregular.

‡ One of these was negative at three weeks. No later tests of the blood were made. The baby was healthy when last seen, at the age of 5 months.

§ One of these was 4+ at 2 months but negative at 7 months, after one course of treatment.

CASE 4.—The first child of a 26 year old colored woman was born at term. The Wassermann reaction of the cord blood was negative. Thirteen prenatal treatments were given. The baby had thirteen irregular treatments. The Wassermann reaction of the blood was 4+ at 7 months.

CASE 5.—The third child of a 37 year old colored woman was born at term. The mother's Wassermann reaction had been negative twice. The Wassermann reaction of the cord blood was 3+. The baby showed a 4+ Wassermann reaction of the blood at 10 days. Roentgen examination of the bones gave negative results at 10 days. The Wassermann reaction of the blood was 2+ at 4 months. The patient received one course of treatment beginning at this time. The Wassermann reaction was negative, and the Kahn reaction 2+, at 7 months. Further treatment was refused.

CASE 6.—The fifth child of a 20 year old colored woman was born at term; only one of the other children was still living. The Wassermann reaction of the

cord blood was 4+. No prenatal treatments were given. The baby received no treatment. The Wassermann reaction of the blood was 4+ at 6 months.

CASE 7.—In the third child of a 27 year old colored woman (the two other children were dead) the Wassermann reaction of the cord blood was 4+. No prenatal treatments were given. The infant was born at term. One course of treatment was given at irregular intervals. The Wassermann reaction of the blood was 4+ at 5 months. Further treatment was refused. (The child was alive and in fair health at 2 years.)

CASE 8.—The third child of a 29 year old colored woman was born at term. The Wassermann reaction of the cord blood was 4+. Three prenatal treatments were given. The baby had ten irregular injections, beginning at 6 months of age. The Wassermann reaction was 4+ at 1 year. Further treatment was neglected.

It will be noticed that two of these cases (1 and 4) occurred in the group comprising those who received eight or more prenatal treatments. According to McCord,[9] eight or more prenatal treatments should insure a healthy baby, but this only proves that it is not the number of treatments so much as the time they are started that is the important fact, as in both of these cases treatment was started late in pregnancy.

This brings up the question of the effect of treatment in the mother on the Wassermann reaction of the cord blood. According to our figures the outcome of the Wassermann test of the cord blood is influenced by treatment in the mother only to a small degree. The following statistics help to bear this out.

In the babies of mothers receiving eight or more prenatal treatments, the Wassermann reactions of the cord blood were:

4+ in 10 (39%)..... } Moderately positive in 7 }	65.5%
Negative in 7	27.0%
No record in 2	7.5%
Total number of cases, 26	

In the babies of mothers receiving less than eight treatments, the Wassermann reactions of the cord blood were:

4+ in 36 (44.4%)..... } Moderately positive in 14 }	61.79%
Negative in 25	30.8 %
No record in 6	7.5 %
Total number of cases, 81	

The only difference that would be expected is noted in the reduction in percentage of 4+ reactions, but the actual percentage of moderately and strongly positive reactions seems to be increased in those having more prenatal treatments. A larger number of cases might show a more definite difference in results. The mothers' Wassermann reactions are reported as obtained at the first visit; those having

9. McCord, J. R.: South. M. J. **21**:229, 1928.

treatment might have given a different reaction at the time of the confinement. This element tends to upset the value of these statistics.

COMPARISON OF THE WASSERMANN REACTIONS OF MOTHER'S BLOOD AND CORD BLOOD

In 2,758 consecutive cases reviewed we found that either one or both Wassermann reactions were positive in 328, or 11.9 per cent. This would represent the incidence of syphilis as we find it at the Philadelphia Lying-In Hospital. Both Wassermann reactions were positive in 191 cases. In 113 cases the mother's Wassermann reaction was positive and that of the cord blood negative. In 24 cases the reverse was true. In 58 per cent of the cases the tests of the mother's and the cord blood agreed. In 42 per cent they were different.

In our original cases, we found the following Wassermann reactions:

Mother's blood (107 cases) [10]
- 4+ in 91 (85%)
- 3+ in 3
- 2+ in 8
- 1+ in 1
- Negative in 4

} Moderately or strongly positive in 96.3%

Cord blood (99 cases)
- 4+ in 45
- 3+ in 4
- 2+ in 17

} 66.6%

Negative in 33 (33.4%)

TABLE 2.—*Wassermann Reaction of the Cord Blood and of the Blood During the Second Week of Life*

Case	Cord Blood	Blood
1	Negative	Negative 10 days
2	Negative	4+ 14 days
3	3+	4+ 10 days
4	4+	4+ 28 days
5	4+	4+ 14 days
6	2+, Kahn 4+	4+, both, 10 days
7	4+, Kahn 2+	2+, Kahn neg. 12 days
8	Negative	4+ 10 days
9	4+	4+ 10 days
10	4+	Negative 10 days
11	Negative	Negative 10 days
12	Negative	Negative 10 days
13	2+, Kahn neg.	Negative 10 days
14	4+	Negative 14 days

The value of the Wassermann reaction of the cord blood has often been questioned. The general consensus seems to be that a positive reaction in a very high percentage of cases means definite syphilis. A negative Wassermann reaction of the cord blood means nothing, as quite a large percentage of these become positive by the fourth week

10. The mother's Wassermann reaction in most cases was taken at the time of her first visit to the prenatal clinic. This was most often during the last three months of pregnancy.

of life. In an effort to see how soon this change in reaction occurs, we took Wassermann tests of the blood in a few cases near the end of the second week of life (with one exception) with the results shown in table 2.

There are enough of these results to show that the reaction of the blood changes definitely during the first few weeks of life, and that a positive Wassermann reaction in a month old baby is definite evidence of syphilis and a negative Wassermann reaction is a good proof of freedom from the disease.

The following is an analysis of the length of time the cases were followed:

4 months	1 case
5 months	8 cases
6 months	19 cases
9 months	23 cases
12 months	28 cases
18 months	10 cases
2 years	9 cases
3 years	6 cases
4 years	3 cases

98, or 91.5%, followed for six months or more
56, or 52%, followed for at least a year

Table 3 gives the number of subsequent Wassermann tests in the cases followed.

TABLE 3.—*Number of Follow-Up Wassermann Tests*

Number of Tests	Number of Cases
0	1
1	84
2	18
3	2
4	2
Total	107

We have found it rather difficult to get the mothers' full cooperation in most of our cases because of the apparent good health of the babies. When once told the test of the blood is negative they do not bother to return for more tests even though the necessity of these tests is explained to them.

COMMENT

One hundred and seven babies of syphilitic mothers have been followed in our clinic for varying lengths of time and their condition has been checked by studies of the blood and clinical examination. Some of these babies have received antisyphilitic treatment; others were not considered in need of it or were not treated because of the poor cooperation of the parents. In analyzing the result of treatment in the treated patients we find that in not one infant that received at least

one full course of injections, with regular attendance at the clinic, did any signs or symptoms, serologic or clinical, of congenital syphilis become manifest during the period of observation. The few babies developing symptoms or showing a 4+ Wassermann reaction during their first year had received little or no treatment, and their attendance at the clinic had been irregular.

The general condition of the patients followed, when last seen, was extremely good in the great majority of instances. In a few babies whose mothers failed to follow our dietary instructions rickets had developed. One unusual case is worth mentioning in detail, as it proves the point that a negative Wassermann test, alone, should not be relied on as a proof of cure:

In A. C., a white baby, born at term, weighing 11 pounds and 5 ounces (5.1 Kg.) the Wassermann reaction of the cord blood was 2+. The mother's Wassermann reaction was also 2+; she had ten prenatal treatments and some prepregnancy treatment. After the second injection of sulpharsphenamine the baby had convulsions lasting for several hours. This recurred after the third injection. Bismuth was used again, and after ten of these had been given over a rather irregular period, a Wassermann reaction of the blood at 4 months was negative. The infant was not seen for two months; then, at the age of 6 months, he was brought back with clinical and roentgen evidence of dactylitis and scurvy. Treatment was resumed with bismuth, about sixteen more injections being given, with a complete clearing up of all symptoms, both clinical and roentgen, and a negative Wasserman reaction of the blood again at 16 months.

A greater number of patients will have to be treated and followed for longer periods of time to prove our point, namely, that this minimum amount of treatment, started immediately after birth, is sufficient to cure congenital syphilis in this symptomless stage, the equivalent, probably, of the early primary stage of the disease. Our main objection to prolonged treatment in these babies is the fact that it is impossible to tell at birth which ones are going to develop the disease and which are going to escape it. Those that would escape it might be injured to a certain extent by the intensive treatment advocated by most syphilographers. Our experience with babies who show definite signs of syphilis at birth is that they do not survive, even though treated immediately. Only 3 of our 351 patients (less than 1 per cent) showed definite evidence of syphilis during the lying-in period. Two died during the first few months in spite of treatment.

Before our clinic was established, it was not an uncommon occurrence for babies with definite symptoms of congenital syphilis to be brought to our well baby clinic. In the last five years the condition has become almost a rarity.

CONCLUSIONS

1. Only an occasional baby shows clinical evidence of congenital syphilis during the two weeks of the lying-in period.

2. A positive Wassermann reaction of the cord blood is sufficient evidence to warrant giving antisyphilitic treatment early.

3. A negative Wassermann reaction of the cord blood in a child whose mother is definitely syphilitic, although treated during pregnancy, is not sufficient evidence that the baby will escape congenital syphilis.

4. Our experience demonstrates that early treatment of congenital syphilis continued for fourteen weeks gives a high percentage of cures.

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EFFECT OF TONSILLECTOMY AND ADENOIDECTOMY ON THE REACTION TO THE SCHICK TEST (DIPHTHERIA IMMUNITY)

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It is generally admitted that diphtheria is less common in children who have had their tonsils and adenoids removed than in those who have not undergone such an operation. Several explanations have been offered: (1) that removal of the tonsils and adenoids influences the humoral immunity against diphtheria; (2) that it eliminates the portal of entry of the diphtheria bacilli, and (3) that the tonsils offer a fertile soil for the growth of diphtheria bacilli.

Schick and Topper[1] performed Schick tests on children before tonsillectomy and adenoidectomy and again six months after operation. Their results were striking and would indicate that the decrease in diphtheria in tonsillectomized patients is due to the acquisition of humoral immunity, if the Schick test is used as a measure of immunity against diphtheria. They reported observations on 100 children between 1 and 12 years of age who had a positive Schick reaction before tonsillectomy. Eighty-two per cent of the reactions became negative, and only 12 per cent remained positive six months after operation. As this report was based on children in New York and as it was the first report of its kind in this country, it was interesting to know whether the same results would be obtained in other communities. Since then Geddie,[2] in Rochester, Minn., a small community, has reported on the Schick reaction in children whose tonsils had been removed as compared with a group of children whose tonsils had not been removed. In his children a Schick test was not done previous to tonsillectomy. Of 411 children between the ages of 1 and 18 years who had not had an operation on the tonsils and who had not received measures for the production of active immunity against diphtheria, 13.6 per cent gave negative reactions to Schick tests and 86.4 per cent gave positive reactions. In a second group of 96 children who had

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From the Children's Memorial Hospital and the Otho S. A. Sprague Memorial Institute.

1. Schick, B., and Topper, A.: Effect of Tonsillectomy and Adenoidectomy on Diphtheria Immunity, Am. J. Dis. Child. **38**:929 (Nov.) 1929.

2. Geddie, K. B.: Effect of Tonsillectomy and Adenoidectomy on Diphtheria Immunity, Am. J. Dis. Child. **40**:1032 (Nov.) 1930.

had their tonsils removed more than six months previously but who had not received measures for the production of active immunity against diphtheria, 20.8 per cent gave negative reactions and 79.2 per cent gave positive reactions. The results of Geddie's study differ widely from those of Schick and Topper. The difference is really greater than these figures suggest, because in the report of Schick and Topper only children who had had positive Schick reactions before tonsillectomy were retested, while in Geddie's series a group of untested children was used. As he reported 13.6 per cent of children with negative reactions to the Schick test in his group without tonsillectomy, it would be only fair to subtract this number from his percentage of 20.8 for the tonsillectomized group, which would leave approximately only 7.4 per cent of reactions that became negative after tonsillectomy. In September, 1931, Orosz and Kugler [3] reported observations on a series of 161 children on whom they had performed a Schick test from one to six years after tonsillectomy; of these, 73.3 per cent gave positive and only 26.7 per cent gave negative reactions to the Schick test. They did not state that all of these children gave positive reactions before tonsillectomy, which would have considerable bearing on the number of children that gave negative reactions to the Schick test after tonsillectomy.

OBSERVATIONS

The present study is based on the same general plan as was that of Schick and Topper; i. e., all children received a Schick test before tonsillectomy. The children were admitted to the Children's Memorial Hospital for tonsillectomy and adenoidectomy. The patients were all of the average charity dispensary class.

All the tests were performed and read by myself. The first Schick test was made five days before tonsillectomy and adenoidectomy. Occasionally the operation was postponed, and then the period was longer. All readings were made on the fourth and fifth days. Control tests were made on about the first 300 children and after that only on those over 8 years of age, because pseudoreactions were rare under that age. The toxin for the Schick test, already diluted for use, was obtained from the Chicago Health Department, or the undiluted toxin was obtained from them and diluted in our laboratory. The dilutions in both instances were always freshly made from one to three hours before use. The children were always tested in groups of from 8 to 15, so that there were usually some who gave positive and some negative reactions to the same lot of toxin solution. This work covered a period of sixteen months, beginning in May, 1930. The patients ranged in

3. Orosz, D., and Kugler, G.: Tonsillektomie und Schickreaktion, Arch. f. Kinderh. **94**:168 (Sept. 11) 1931.

age from 2 to 12 years, inclusive, as older children are not admitted to the dispensary. The parents and the children were asked about diphtheria immunization against diphtheria, exposure to diphtheria and whether the children had ever been carriers. This information was as accurate as it is possible to obtain. All the children with positive reactions were asked to return six months after operation, at which time they were retested. In a few instances they did not return for from nine to ten months.

In the accompanying table are grouped only those children who had not had diphtheria and who were not suspected of having had diphtheria. They had not been subjected to measures for the production of active

Schick Reactions of Children Who Have Never Received Measures for the Active Production of Immunity Against Diphtheria and Who Have Never Had Diphtheria or Recieved Diphtheria Antitoxin

	Before Tonsillectomy and Adenoidectomy					Previously Positive Cases Retested Six Months After Tonsillectomy and Adenoidectomy				
Age in Years	Total Cases	Positive	Per Cent	Negative	Per Cent	Total Cases	Positive	Per Cent	Negative	Per Cent
2 to 3	9	9	100	0	0	7	7	100	0	0
3 to 4	46	39	85	7	15	23	22	96	1	4
4 to 5	53	44	83	9	17	30	29	97	1	3
5 to 6	61	45	74	16	26	24	22	92	2	8
6 to 7	80	66	82	14	18	41	37	90	4	10
7 to 8	64	42	66	22	34	23	21	90	2	10
8 to 9	55	33	60	22	40	17	15	88	2	12
9 to 10	36	14	39	22	61	8	7	87	1	13
10 to 11	29	14	48	15	52	4	2	50	2	50
11 to 12	21	10	48	11	52	7	7	100	0	0
12 to 13	16	9	56	7	44	7	7	100	0	0
Total	470	325	69	145	31	191	176	92	15	8

immunity before or after tonsillectomy. None of them had been known to be a carrier, and none of them had had known exposure to diphtheria. Of 470 children in this group tested before tonsillectomy, 325, or 69 per cent, gave positive reactions to Schick tests and 145, or 31 per cent, gave negative reactions. Of the 325 children who gave positive reactions, 191 returned from six to nine months after operation; 176, or 92 per cent, of these still had positive reactions to the Schick test, and only 15, or 8 per cent, had negative reactions. These figures are just the opposite to those given by Schick and Topper, but they coincide closely with those of Geddie. In my series, operation had very little influence on the Schick reaction. It would also seem that the small amount of toxin in the Schick material had little influence on the development of diphtheria immunity as measured by the Schick test after a period of from six to nine months. As children grow older, an increasing percentage normally give negative reactions to the Schick

test. This can be taken generally as from 5 to 10 per cent per year, which, according to my data, would reduce the value of tonsillectomy for immunity against diphtheria, as measured by the Schick test, to very little in this group.

A group of 96 children between 4 and 12 years of age not included in the table, who had not been subjected to measures for the production of active immunity or who had not had diphtheria, were given a Schick test six months after tonsillectomy and adenoidectomy. None of them had been tested before operation. Of this group, 66, or 69 per cent, gave positive and 30, or 31 per cent, gave negative reactions. This coincides with the results in the table before tonsillectomy and would further indicate that the toxin of the Schick material did little to increase the antibodies high enough to give a negative reaction to the Schick test.

During a period of ten months, when the majority of the Schick tests were being performed, Dr. Peacock[4] made routine cultures of specimens from the noses and throats of all children before tonsillectomy for the Klebs-Löffler bacillus. Of 1,008 children, 52, or 5.15 per cent, had positive cultures, which is the average for urban communities, and so would have no undue influence on the results in this series of children.

No explanation can be given for the marked difference between the results of this series of Schick reactions before tonsillectomy and six months after tonsillectomy and those of Schick and Topper. There is, however, an agreement of these results with those of Geddie.

CONCLUSIONS

Although this is a study of children from a crowded, urban community and wholly of charity patients, the following conclusions seem warranted as regards this particular series of children:

1. Tonsillectomy and adenoidectomy had very little influence toward changing a positive Schick reaction to a negative one at the end of from six to nine months after operation.

2. The small amount of toxin in the Schick test had little influence on the development of humoral immunity to diphtheria as measured by the Schick test over a period of from six to nine months after tonsillectomy.

3. It would seem that the decreased incidence of diphtheria after tonsillectomy and adenoidectomy is not due to increased humoral immunity to diphtheria as measured by the Schick test, but may be due to the removal of a portal of entry or of a fertile soil for the growth of the diphtheria bacilli.

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4. Peacock, S. A.: Unpublished data.

INSENSIBLE PERSPIRATION IN INFANCY AND IN CHILDHOOD

IV. BASAL MEASUREMENTS IN DEHYDRATED INFANTS

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In a previous paper of this series,[1] basal standards were presented for the insensible perspiration of normal and marasmic infants. The constancy of these standards was demonstrated within a range of environmental conditions[2] analogous to the standard conditions for measuring their basal metabolism. Beyond this range, the extrinsic factors of clothing, temperature, humidity, diet and muscular activity were shown to exert a notable influence on this measurement.

With basal standards available for normal infants, the next problem was to investigate the effect of pathologic states on this mechanism during infancy. Since water vapor forms the main component of the insensible perspiration,[3] it seemed reasonable to assume that the state of hydration of the body was an important factor in its regulation and that any derangement of the water metabolism might lead to alterations in its measurement. A classic example of deranged water exchange in the infantile organism is the state of anhydremia induced by alimentary

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From the Department of Pediatrics, Cornell University Medical College and the New York Nursery and Child's Hospital.

1. Levine, S. Z.; Kelly, M., and Wilson, J. R.: Insensible Perspiration in Infancy and in Childhood: II. Proposed Basal Standards for Infants, Am. J. Dis. Child. **39**:917 (May) 1930.

2. Levine, S. Z.; Wilson, J. R., and Kelly, M.: Insensible Perspiration in Infancy and in Childhood: I. Its Constancy in Infants Under Standard Conditions and Effect of Various Physiologic Factors, Am. J. Dis. Child. **37**:791 (April) 1929.

3. The insensible loss includes all of the gaseous emanations that leave the body by way of the skin and the respiratory passages. As measured by the method of weighing, its principal constituent is water vapor, but it also contains exhaled carbon dioxide less simultaneously absorbed oxygen and traces of other gases. Within the ordinary range of respiratory quotients, moisture comprises from 85 to 95 per cent of the total insensible loss (Johnston, M. W., and Newburgh, L. H.: Determination of Total Heat Eliminated by the Human Being, J. Clin. Investigation **8**:147 [Feb.] 1930).

intoxication (infantile diarrhea). If the foregoing assumption holds, this anomaly, accompanied as it is by a markedly reduced water loss through the kidneys (oliguria and even anuria) and by an excessive excretion of water in the stools (diarrhea), should lead to an altered elimination of water through the skin and lungs (insensible perspiration or, more accurately, water of vaporization). A report of such studies, begun by us in 1928, is particularly opportune at the present time in view of the recent communication by MacQuarrie and his associates [4] showing that the dehydration induced for therapeutic reasons in older children with epilepsy is accompanied by a consistent and notable diminution of their daily insensible loss of body weight.

This report presents basal measurements of the insensible perspiration of infants in a state of dehydration accompanied by excessive water loss in the stools. The twenty-four hourly insensible loss in this condition will be reported in a subsequent communication.[5]

PLAN OF STUDY

The apparatus, technic of measurements and sources of error of the method were fully considered in the first paper of this series.[2] That study established the reliability of measurements with the balance and demonstrated that with careful technic the experimental error of the method of weighing was probably less than 10 per cent. The standard conditions previously found to yield basal measurements were employed throughout this investigation (table).

The present series comprised twenty-four infants from 1 to 10½ months of age in various states of nutrition. They were all suffering from diarrhea accompanied by mild, moderate or extreme dehydration. The rectal temperatures of all infants remained essentially constant throughout observations and with three exceptions (S.T., W.L. and R.B.) were less than 100 F. The insensible perspiration of these subjects was determined in forty-five basal observations of from forty-four to one hundred and thirty-nine minutes by the method of weighing. Sixteen of the infants were studied during the period of acute illness and following recovery. The remaining eight infants were studied only once during the period of dehydration. So far as possible, experimental conditions were maintained constant in repeated observations on the same infant. The detailed data appear in the table.

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4. Manchester, R. C.; Husted, C., and MacQuarrie, I.: Influence of the State of Hydration of the Body on the Insensible Loss of Weight in Children, J. Clin. Investigation **4**:39 (May) 1931.

5. Levine, S. Z.; Wyatt, T. C., and Kelly, M.: Insensible Perspiration in Infancy and in Childhood: V. Daily Measurements in Dehydrated Infants, to be published.

Detailed Data of Observations

Name	Age, Mo.	Sex*	Weight, Kg.	Height, Cm.	Surface Area,† Sq.M.	Date	Duration of Observations, Min.	Temperature: Rectal, Average Degrees, F.	Temperature: Environment, Average Degrees, C.	Relative Humidity, Average %	Condition of Subjects‡: Dehydration Skin Turgor	Condition of Subjects‡: Serum Protein‖	Condition of Subjects‡: Toxicity	Insensible Perspiration in Grams: Total per Hr.	Insensible Perspiration in Grams: Per Kg. per Hr.	Insensible Perspiration in Grams: Per Sq.M. per Hr.	Comment#
						1928											
S. R.	1	♀	3.90	55.5	0.235	10/16	96	98 0	25.5	56	0	....	0	3.75	0.96	16.0	Control
	2		3.97	58.0	0.244	11/16	77	98.7	25.4	46	+	8.02	0	4.47	1.13	18.3	
D. T.	3	♀	2.83	53.5	0.200	11/14	50	98.0	25.4	36	++	8.30	0	3.88	1.37	19.4	
						1929											
R. M.	2	♂	4.40	59.0	0.258	5/ 2	70	98.4	25.5	60	+	....	0	4.46	1.01	17.3	
P. K.	2½	♂	3.71	55.2	0.231	11/13	76	98.4	24.4	45	++	7.14	0	3.95	1.06	17.2	
	3		3.88	55.5	0.235	11/22	118	96.7	24.0	28	0	....	0	4.07	1.05	17.3	Control
L. R.	1½	♂	3.33	54.2	0.218	2/27	98	98.4	26.7	41	+	7.31	0	4.70	1.41	21.6	
J. C.	4	♂	4.41	57.2	0.253	3/ 1	76	98.6	25.5	28	+	8.37	+	5.53	1.25	21.9	
W. B.	3	♂	4.12	59.0	0.252	3/ 4	117	97.5	25.5	34	++	8.90	++	4.74	1.15	18.8	
	4		3.98	59.0	0.248	3/18	128	97.5	24.0	34	0	8.02	0	4.59	1.15	18.5	Control
A. F.	..	♂	2.97	52.4	0.202	4/ 3	72	97.7	26.7	35	+++	....	+++	4.50	1.52	22.3	
S. T.	7	♂	5.25	63.7	0.294	4/12	153	100.2	25.0	39	+	....	0	5.98	1.14	20.3	
						1930											
R. G.	2½	♂	3.27	55.0	0.218	1/22	64	97.0	24.4	29	+++	6.22	+	3.28	1.00	15.0	
C. W.	4	♂	4.57	62.5	0.274	4/ 1	64	98.0	....	..	+++	7.49	++	4.25	0.93	15.5	
	5½		3.96	62.5	0.259	5/23	86	96.7	27.2	51	0	....	0	5.39	1.36	20.8	Control
	5½		3.99	62.5	0.260	5/27	113	95.1	25.0	39	0	....	0	4.60	1.15	17.7	Control
W. L.	5	♂	4.87	63.5	0.285	4/25	56	100.2	25.0	28	+	6.28	0	4.29	0.89	15.1	
	5		4.41	63.5	0.274	4/29	74	98.4	24.4	26	++	8.08	0	4.49	1.02	16.4	
	5½		4.97	64.0	0.290	5/16	104	99.7	25.0	49	0	....	0	6.09	1.23	21.0	Control
J. M.	4	♂	3.38	57.5	0.227	5/ 3	113	97.9	27.2	25	++	7.48	0	3.61	1.07	15.9	
	4		3.44	58.0	0.233	5/14	110	98.3	26.7	41	0	....	0	4.53	1.32	19.4	Control
A. S.	2	♂	3.02	47.5	0.188	5/ 5	44	98.8	27.8	31	++	7.43	0	3.77	1.25	20.1	
J. V.	6½	♂	6.91	69.0	0.352	6/18	96	99.7	27.8	69	+	6.39	0	5.63	0.81	16.0	
	6½		6.71	69.0	0.347	6/19	67	99.4	28.9	56	+++	6.97	++	6.02	0.90	17.3	
	7		7.00	69.5	0.357	6/30	98	98.7	27.2	56	0	....	0	7.44	1.06	20.8	Control
	7		7.02	69.5	0.358	7/ 1	84	98.6	27.2	56	0	....	0	7.86	1.12	21.9	Control
A. C.	2	♂	3.89	55.0	0.234	6/28	85	99.8	27.8	..	+	8.73	+	4.02	1.03	17.2	
	3		4.01	57.5	0.244	7/28	90	97.5	26.7	..	0	7.03	0	5.47	1.36	22.4	Control
J. R.	2½	♀	3.46	55.5	0.224	7/28	79	98.7	26.7	..	++	7.56	++	3.49	1.01	15.6	
	3		3.50	55.5	0.225	8/ 9	80	98.2	28.9	..	0	....	0	4.15	1.19	18.4	Control

V. M.	2½	♂	3.73	58.0	0.239	7/28	61	98.4	26.7	..	+++	6.94	+++	2.83	0.76	11.8	
	3		4.12	59.5	0.253	8/ 7	92	98.1	28.9	..	0	....	0	4.63	1.13	18.3	Control
R. B.	4½	♂	5.77	64.0	0.308	7/31	103	98.7	28.9	..	++	7.48	++	5.27	0.91	17.1	Active pulmonary tuberculosis
	5		5.54	64.0	0.303	8/16	86	100.8	26.7	..	0	8.12	+++	5.37	0.97	17.7	Control; fever
W. W.	2½	♂	3.95	58.5	0.247	8/16	80	98.3	26.7	76	+++	8.43	++	4.50	1.14	18.2	
	3		4.08	58.5	0.256	9/ 1	59	98.1	28.1	70	0	....	0	5.59	1.37	21.8	Control
K. S.	5	♂	4.01	61.0	0.257	9/22	88	98.7	29.4	35	+++	....	0	4.28	1.07	16.7	
	6½		4.47	62.0	0.268	11/ 4	69	98.6	22.2	46	0	....	0	5.04	1.13	18.8	Control
	8		5.65	62.5	0.303	12/16	96	98.6	22.6	46	0	....	0	7.23	*1.28	23.9	Control
J. L.	5½	♀	5.93	67.0	0.322	10/ 2	68	98.9	26.7	38	+++	9.54	+++	6.98	1.18	21.7	
	7		6.09	70.0	0.340	11/20	104	98.2	24.0	51	0	6.57	0	5.78	0.84	17.0	Control
R. B.	10	♂	4.22	60.5	0.261	10/ 7	48	99.3	24.4	35	+++	8.12	++	6.25	1.48	23.9	
	10½		4.39	61.5	0.267	10/31	91	97.8	24.0	44	0	....	0	6.22	1.42	23.3	Control
						1931											
R. G.	5	♂	4.49	63.5	0.276	1/22	50	98.6	22.2	49	+++	....	+	5.94	1.32	21.5	
	5½		4.96	63.5	0.287	2/ 3	139	97.8	22.8	73	0	....	0	5.31	1.07	18.5	Control

* ♂ indicates boys; ♀, girls.

† Derived from the nomogram by R. R. Hannon for estimating surface area of children according to the formula of Du Bois and Du Bois, in Du Bois, E. F.: Basal Metabolism in Health and Disease, ed. 2, Philadelphia, Lea & Febiger, 1927, p. 124.

‡ The intensity of dehydration and toxicity is represented arbitrarily as follows: 0, absent; +, mild; ++, moderate; +++, severe.

‖ Refractive index (Reiss).

All subjects were asleep during observations; all meals preceding observations were low in total calories, fluid and protein content. They were, in most instances, of approximately similar composition preceding repeated observations on the same infant. The term, control, indicates observations on the infants following recovery while in a state of normal hydration.

The severity of dehydration was estimated clinically from the turgor of the skin and checked by determinations of the serum protein (refractive index—Reiss). In general, these two criteria corresponded. In the few divergent instances, the skin turgor was considered to be the more reliable index of the extent of water depletion. The degree of intoxication was judged from the composite clinical picture together with the level of the alkali reserve of the blood.

RESULTS

Two methods of control were utilized to evaluate the results. In the first method (chart 1), the basal figures for the entire series of

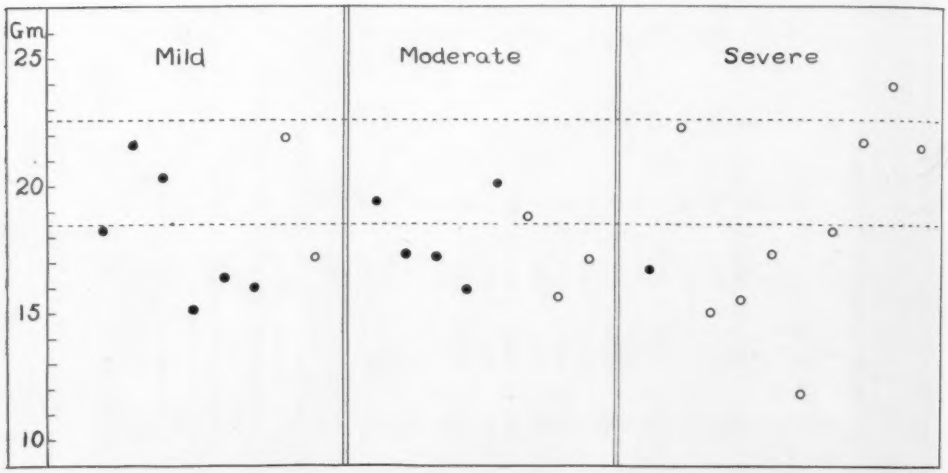

Chart 1.—The basal insensible perspiration of dehydrated infants in grams per square meter of body surface per twenty-four hours. The dots represent nontoxic infants; the circles, toxic infants. The area inclosed by the dash lines represents the average range (± 10 per cent) previously reported for normal infants.

twenty-four infants with anhydremia were plotted against the average normal standard (in grams per square meter per hour) previously reported for healthy infants of similar age, weight and stature.[2] In the second method (chart 2), the basal values during dehydration and following recovery were compared in the sixteen infants in whom measurements were made during both periods.

Chart 1 shows that of the twenty-six measurements made on the twenty-four infants with dehydration, sixteen (61 per cent) fell below, nine (35 per cent) fell within and one (4 per cent) was above the normal average range (± 10 per cent). The average value for the entire group was 18.2 Gm. per square meter per hour, as against the average standard for normal infants of 20.5 Gm., the average deviation being —11

per cent. The trend of the basal insensible loss in this group of dehydrated infants was, therefore, definitely toward lower levels. No consistent correlation, however, was evident in individual infants between the severity of dehydration, judged either clinically or from the serum protein, and the determined values; the average figures for the three groups with mild, moderate and severe dehydration were 18.5, 17.6 and 18.4 Gm. per square meter per hour, respectively. Similarly, the degree of toxicity as estimated from the pallor, prostration, hyperpnea, mental state and fever, or from the acid-base status of the blood, was apparently unrelated to the observed figures. This brief analysis of the results suggests that, in general, dehydration of the tissues tends

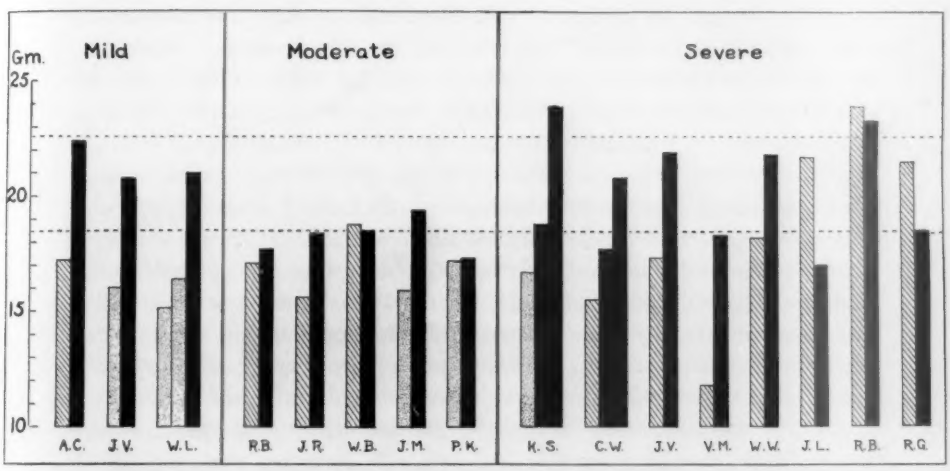

Chart 2.—The basal insensible perspiration of infants during dehydration (cross hatched and stippled columns) and following recovery while in a state of normal hydration (black columns). The cross hatched columns indicate toxic subjects; the stippled columns, nontoxic subjects. The normal average range is shown as in chart 1.

to depress the basal rate of insensible perspiration of infants, but that the magnitude of the decline is not necessarily nor solely a function of the intensity of anhydremia.

An obviously more reliable index of the effect of a state of anhydremia on the insensible loss is afforded by a comparison of the results obtained in the same infant while dehydrated and following recovery while in a state of normal hydration. Such measurements were secured in sixteen infants under comparable experimental conditions. The comparative results are graphically shown in chart 2.

The basal insensible perspiration of ten infants (62 per cent) attained a definitely higher level with convalescence; in three infants

(19 per cent) the rate remained essentially unchanged, and the insensible loss of the remaining three infants (19 per cent) fell to an appreciably lower level with recovery (chart 2). The respective averages for the whole group during dehydration and after recovery were 17.5 and 19.7 Gm. per square meter per hour. Dehydration of the tissues in this group of sixteen infants resulted in a reduction of 11 per cent below the average basal rate observed following recovery. The previously noted tendency toward lowered basal levels of insensible loss in the anhydremia of infants is confirmed by these data.

Further analysis of the results again suggests that the magnitude of water deficit of the body is not the sole factor that determines the level of the insensible perspiration in anhydremia. As noted in chart 2, the decrements of decline in individual infants were not consistently related to the intensity of their dehydration, nor were the increments of increase with recovery correlated with the initial severity of the anhydremia. For example, the figures for the three groups with mild, moderate and severe dehydration averaged 16.7, 16.8 and 18.3 Gm. per square meter per hour, respectively, during the periods of acute illness. These averages represent reductions of 16.9, 10.2 and 9.4 per cent below the respective basal levels obtained in the three groups while in a state of normal hydration. It is noteworthy that the minimal deviation, both absolute and percentile, occurred in the most severely dehydrated group of subjects. Moreover, the highest and lowest figures in the entire series (11.8 and 23.9 Gm. per square meter per hour) were yielded by two subjects who exhibited anhydremia and toxicity of apparently corresponding severity. Paradoxically, the three infants whose basal rates of insensible loss fell with recovery were among the most markedly dehydrated and most profoundly toxic of the whole group when the initial observations were made. These results are contrary to expectation if one accepts the assumption that the state of hydration of the body or toxicity *per se* are the sole controlling factors in the physiologic regulation of this mechanism.

COMMENT

The number of infants studied is too few and the results are not sufficiently consistent to warrant definite conclusions. The evidence suggests that the general trend of the basal insensible perspiration of infants with dehydration is toward lower levels. The lack of consistent correlation, however, between the intensity of dehydration, judged either clinically or from the serum protein, and the decrement of decrease of the insensible loss is presumptive evidence that the state of hydration of the body *per se* is not the sole factor accountable for the decline. Similarly, the degree of toxicity does not appear to be the sole causative agent of the frequently observed reduction. Other

intrinsic factors of established importance in the physiologic regulation of the insensible perspiration include the rate of blood flow through the cutaneous capillaries [6] and the level of the skin temperatures.[7] Measurements of these factors were unfortunately not made in this study, but alterations of their function have been shown to be present in the anhydremia of infants.[8] If it is true that these intrinsic mechanisms in conjunction with the state of hydration of the tissues [9] constitute a physiologic trilogy for controlling in large measure the rate of insensible perspiration, one may tentatively conclude that the ultimate level of the insensible loss is regulated by the interaction of all three variables and that the inconsistencies noted in this study may well have had their origin in the varying activity of the unmeasured factors. Other physiologic mechanisms, as yet unrecognized, may also play an important rôle in the regulation of the insensible perspiration. One further inference that may be adduced from the evidence is that the state of hydration of the body and the degree of toxicity as estimated by the routine methods in common use are not necessarily reliable indexes of the peripheral blood flow or of the surface temperatures.

Interpretation of the data is further complicated by the lack of rigid control of environmental temperature and humidity since psychrometric chambers were not available in this study. However, variations in these extrinsic factors do not appear to be of sufficient magnitude (table) to explain the lowered basal rate of insensible loss observed in many of the dehydrated infants. To eliminate this possible source of error, plans are under way to repeat this study with the aid of psychrometric chambers which will be available in the near future.

The present series of observations were made under so-called basal conditions (sleep, small preceding meal, comfortable environment and the absence of visible sweating). Under these basal conditions the heat-regulating mechanism of the body may compensate for the markedly reduced moiety of water in the organism by safety factors, as yet

6. May, E.: Perspiratio insensibilis und Diathermia, Ztschr. f. klin. Med. **116**:13 (March) 1931. Eimer, K.: Untersuchungen über das Wesen der Perspiration, Arch. f. exper. Path. u. Pharmakol. **125**:150, 1927.

7. Eimer (footnote 6, second reference). Miles and Johnson: The Temperature of the Human Skin, Proc. Nat. Acad. Sc. **5**:218 (June) 1919. Benedict, F. G.: Die Temperatur des menschlichen Haut, Ergebn. d. Physiol. **24**:594, 1925. Cobet, R.: Die Hauttemperatur der Menschen, ibid. **25**:439, 1926.

8. Marriott, W. McK.: Some Phases of the Pathology of Nutrition in Infancy, Am. J. Dis. Child. **20**:461 (Dec.) 1920. Utheim, K.: A Study of the Blood and its Circulation in Normal Infants and in Infants Suffering from Chronic Nutritional Disturbances, ibid. **20**:366 (Nov.) 1920.

9. Manchester, Husted and MacQuarrie (footnote 4). Engels, W.: Die Bedeutung der Gewebe als Wasserdepots, Arch. f. exper. Path. u. Pharmakol. **51**: 346, 1904.

unidentified, and sufficient water may be made available for evaporation from the skin and from the respiratory tract. Under stress of muscular activity, these safety factors may break down with a consequent diminution in the elimination of moisture through these channels. Such an hypothesis might explain the slight and inconstant fall of the insensible perspiration in our infants who were observed under basal conditions and the considerable and invariable decline found by MacQuarrie and his collaborators [4] in their older children who were studied under maintenance conditions. A detailed discussion of the twenty-four hourly insensible perspiration of infants suffering from anhydremia will be embodied in the subsequent report.[5]

The well known direct relation between the insensible perspiration and the energy metabolism in normal persons from infancy to old age [10] suggests the possibility that the diminution of the former, when present in the anhydremia of infants, may be accompanied by a corresponding reduction of their basal metabolism. Evidence bearing on this point is practically negligible. The few observations that we have made in the respiration chamber on infants with this condition have thus far yielded normal figures for their basal metabolic rates. The reduced basal insensible perspiration frequently noted in this condition cannot, therefore, be ascribable in all instances to a diminished basal metabolism. These results, if confirmed, would imply that the recently proposed method of predicting the probable energy metabolism from the measured insensible perspiration under standard conditions may not be applicable to infants suffering from dehydration. This phase of the question must also await further work, which is now in progress.

In the preceding discussion, attention was directed principally to the moisture component of the insensible perspiration. The possibility remains that gases other than water vapor (carbon dioxide less oxygen [3]) may be implicated in the lowered basal rate of insensible loss frequently observed in dehydrated infants. Newburgh and his collaborators [4] have calculated that the water content of the insensible perspiration may vary from 82 to 104 per cent when the respiratory quotient falls from unity to 0.707. This maximum range of variation of 22 per cent attributable to gases other than water vapor markedly exceeds the average decrease of 11 per cent in the total insensible loss of our dehydrated infants. It is interesting that in the few previously mentioned observations on dehydrated infants in the respiration cham-

10. Levine, S. Z., and Marples, E.: Insensible Perspiration in Infancy and in Childhood: III. Basal Metabolism and Basal Insensible Perspiration of the Normal Infant; A Study of Reliability and of Correlation, Am. J. Dis. Child. **40**:269 (Aug.) 1930. Benedict, F. G., and Root, H. F.: Insensible Perspiration: Its Relation to Human Physiology and Pathology, Arch. Int. Med. **38**:1 (July) 1926. Johnston and Newburgh (footnote 3).

ber, the total heat production and the water elimination through the skin and lungs remained at normal levels, but the respiratory quotients were consistently below the range usually observed in normal infants under comparable conditions. Calculation of the average differences in the normal and dehydrated groups (respiratory quotients of 0.85 and 0.76, respectively) shows that the altered relation of exhaled carbon dioxide to absorbed oxygen might account for as much as 8 per cent of the total weight of the insensible perspiration even in the presence of an unchanged quota of moisture. It is therefore conceivable that a diminished water output may not have been the primary factor responsible for the average fall of 11 per cent in the total insensible loss observed in this series of dehydrated infants. Further observations in the respiration chamber which afford data for partitioning the insensible perspiration into its component parts will show which fraction contributes most to the reduced total insensible perspiration frequently noted in the anhydremia of infants.

It is evident from this discussion that there are a multiplicity of factors involved in the physiologic control of the insensible perspiration in the anhydremia of infants. Critical evaluation of the underlying mechanisms must await the accumulation of data on these several factors.

SUMMARY AND CONCLUSIONS

The basal insensible perspiration of twenty-four infants was determined in forty-five observations under comparable conditions by the method of weighing during a period of dehydration and following recovery.

The results indicate a tendency toward a lowered basal rate of insensible perspiration in the anhydremia of infants. The decrement of decrease, however, does not seem to be directly related to the intensity of dehydration, nor to the degree of toxicity as estimated by routine clinical procedures. Other physiologic factors besides the state of hydration of the body apparently play a rôle in determining the ultimate level of the insensible perspiration in this condition. The significance of these several factors has been briefly considered.

161 West Sixty-First Street.

ASPIRATION IN THE TREATMENT OF EMPYEMA IN CHILDREN

WITH A CRITICAL EVALUATION BASED ON NINETY-FOUR CASES

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In 1929 we [1] reported a series of thirty-three consecutive cases of empyema in children, with a mortality of 9.1 per cent. Of these patients, twenty-eight, or 85 per cent, were cured by aspiration alone. One infant of 4 months of age recovered by spontaneous rupture through a bronchus. One older child was operated on after a number of aspirations had been done because the heart remained far to the right of its normal position. In the light of subsequent experience we feel sure that this child, too, would have recovered by aspiration alone. There were three deaths. One of these occurred in a child who went home against advice and died a week later; the second in an infant who died of pneumococcus septicemia and meningitis and in whom the incidental empyema cavity had a capacity, at autopsy, of less than 1 fluid ounce (30 cc.), and the third in an older child, who had a prolonged bilateral pneumonia and empyema, was for weeks in a Warren Collins oxygen tent and was at all times so critically ill that the surgeon did not think it safe to operate. We were naturally encouraged to continue a method of treatment that had given us results such as we had never approximated with the usual surgical procedures. We were, however, and so stated, fully cognizant of the yearly and seasonal vagaries of infection, and we were therefore interested in seeing whether our experience of one year represented a norm or was the result of a peculiarly favorable year. It is our present purpose to report our experience over three calendar years, a period that would seem long enough to tend to iron out to some degree the differences resulting from yearly variations of infection.

The total series comprises ninety-four consecutive cases of empyema in children treated by aspiration, to those occurring in 1928 being added thirty-one in 1929 and thirty in 1930. Our method of pro-

From the Children's Memorial Hospital.

1. McEnery, Eugene T., and Brennemann, Joseph: Aspiration in Empyema of Children, J. A. M. A. **93**:362 (Aug. 3) 1929.

cedure in the second two years was in every way the same as that reported in the previous paper, except in one respect. We resorted to surgical treatment more quickly whenever this seemed to offer a safer course beyond the period of infancy, either because of some complication, such as nephritis, or because recovery by aspiration alone seemed uncertain or unduly delayed. Thus, while only one child was operated on in 1928, seven were operated on in 1929 and five in 1930.

There were three deaths in 1928, five in 1929 and four in 1930, with corresponding mortality rates of 9.1 per cent, 16.1 per cent and 13.3 per cent. The total mortality was 12.8 per cent. Of the ninety-four patients, sixty-eight, or 72 per cent, recovered without operation; sixty-six, or 70 per cent, were cured by aspiration alone, and two recovered following spontaneous rupture through a bronchus without local treatment. The only death among the thirteen patients operated on after repeated aspirations was due to tuberculous meningitis.

In fifty-four patients (57 per cent) a pyopneumothorax occurred, twelve times spontaneously and forty-two times following aspiration. Among the latter group, however, subsequent rupture through a bronchus occurred in some instances. Since our method of aspiration excludes the possibility of air being drawn in through the aspirating needle, it seems necessary to assume that pneumothorax that followed aspiration was due to puncture of the lung with the needle, resulting in escape of air from the lung into the pleural cavity. That this can occur was demonstrated accidentally in one instance, as reported in our former paper. The only other explanations, namely, tearing of the lung through negative pressure or the formation of a vacuum, are in the one instance improbable and in the other unthinkable. In some instances a small amount of air was introduced into the pleural cavity in the act of dislodging fibrin masses from the end of the needle. We do not think, however, that any of the pneumothoraxes reported as such could be explained on this basis, as the amount of air so introduced never exceeded a few cubic centimeters. Among the twelve patients with spontaneous pneumothorax there were no deaths; among the forty-two with pneumothorax following aspiration there were eight deaths. The mortality among all of those with pneumothorax was 14.8 per cent, only 2 per cent above those without pneumothorax. In spite of the slightly higher mortality shown in these figures our opinion, expressed in the former paper, that this complication is relatively harmless remains unchanged. This conviction is based both on general impressions and on an analysis of individual cases. Spontaneous pneumothorax, always accompanied by the free coughing of pus, seemed, on the whole, rather a help than a hindrance to quick recovery. This is in striking contrast to the serious prognosis that is usually given when this compli-

cation occurs. Pneumothorax following aspiration may have delayed recovery to a slight extent, but this is impossible to estimate with any degree of precision. We find it difficult to understand why others have not observed or reported a similar occurrence of pneumothorax following aspiration. In no instance, so far as can be determined from the history and from prolonged observation, was there a persistent bronchial fistula. These observations seemed to us of great interest in view of the apparent paucity of similar observations as revealed in the literature.

The commonly accepted view that the large masses of fibrin so often encountered during open operation for empyema offer a serious obstacle to aspiration has not been confirmed by our experience in a single instance. These masses are evidently liquified after a time, apparently by a process of digestion by a proteolytic ferment, and present no greater obstacle than the occasional necessity of expelling small occluding pieces from the end of the rather large needle by pushing the plunger of the syringe and the contained air, or pus, in the direction of the needle.

Comparative statistics, to be of full value as a measure of the efficacy of any method of treatment of empyema in children, would require a detailed report for each patient. This is not feasible. To be of any value, however, such statistics must always include the date of the report, the ages of the patients, the identity of the causative organism and the cause of death in each instance. Moreover, unless a report deals with a large number of consecutive cases and extends over a period of several years, it may even be seriously misleading. Thus, the mortality in our series varied from zero in four patients under 1 year of age in 1928 to 43 per cent among seven such patients in 1929 and 66.6 per cent among three such patients in 1930. In 1925 Graham [2] observed no death following operation for empyema among fifteen children of all ages, and in the following year his mortality among seventeen patients was 23.5 per cent. Because of factors that have tended to produce a great lowering of mortality to a fairly uniform level in recent years by all methods of treatment of empyema in children, it is manifestly misleading and unfair to compare these results with those of twenty or thirty or even ten years ago.

When we examine the causes of death in nearly every recent series it becomes evident that empyema itself is only exceptionally a cause. Differences in comparative mortality rates are determined largely by factors that lie outside of the empyema. The causes of death in three patients in 1928 have been stated. Of the nine deaths that occurred in 1929 and 1930, one was due to tuberculous meningitis, two to measles

2. Graham, Evarts A.: Weekly Bulletin of the St. Louis Medical Society **25**:532 (June 26) 1931.

contracted during a small house epidemic and a fourth to a Streptococcus viridans septicemia engrafted on congenital syphilis and tuberculous peritonitis. The remaining five deaths were in infants of 1½, 3½, 5, 5 and 11 months of age, and all but one were due to a staphylococcus infection. The exception was a pneumococcus infection in a Mexican baby of 5 months, who presented the usual low state of nutrition and of resistance to infection so characteristic of that race in our larger northern cities. It is well known that staphylococcus infection in a young infant is nearly always accompanied by multiple abscesses of the lung itself, and probably by an infection of the blood stream as well, both of which cause nearly 100 per cent mortality at that age with any treatment.

The high mortality from empyema in children under 2 years of age and especially under 1 year of age runs as a stereotyped refrain through all statistical reports. Notably is this true of all the older reports that presented mortality rates of 50, 60 and even 75 per cent during that early period. With no deaths among four infants under 1 year of age in 1928, only one among ten under 2 years of age (10 per cent) and only one among twenty-one under 5 years of age (4.8 per cent), we were encouraged to believe not only that infants and young children do better with aspiration alone than with open operation, but that they respond more favorably to aspiration than do older children. While we still believe this to be true, it has not been as evidently so in our subsequent experience. The danger that lurks in making deductions from a small series of only one year's duration becomes evident again from the fact that in 1929 our mortality among seven patients under 1 year of age rose to 43 per cent, and among thirteen patients in the first two years of life to 31 per cent; and in 1930, among three infants under 1 year of age the mortality rose to 66.7 per cent and among nine patients under 2 years of age to 33 per cent. The total mortality in the first year of life in the three year period was 36 per cent, in the second year of life 16.7 per cent and in the first two years combined 25 per cent. Five of our twelve deaths occurred in the first year of life and eight in the first two years. Among the sixty-two patients from 2 to 13 years of age the mortality was 6.5 per cent. Among the twenty-three patients from 6 to 13 years of age there were no deaths, but seven of these were operated on after repeated aspirations.

Inseparably interwoven with the factor of age was that of the type of organism in the effect on both mortality and success with aspiration alone in the present series. It is frequently stated that empyema due to the pneumococcus is the only form that offers a fair chance of cure by aspiration as the sole method of treatment, in spite of the paradox that the pneumococcus is apparently the greatest pro-

ducer of large masses of fibrin. That it does lend itself most favorably of all organisms to such treatment is probably true. It is, however, difficult to estimate this factor with precision, since in even a large series of cases other organisms occur with such relative infrequency that statistics based on such small numbers present the danger inherent in all limited observations. In our series of ninety-four cases of empyema in children under 13 years of age, sixty-seven, or 71 per cent, were found to be due to the pneumococcus; nine, or 9.6 per cent, to a staphylococcus; seven, or 7.4 per cent, to a hemolytic streptococcus, and three, or 3.1 per cent, to Streptococcus viridans. In one instance the only organism obtained was Bacillus pyocyaneus. In one of the two patients with a spontaneous cure through a ruptured bronchus the pneumococcus was isolated from the expectorated pus, and in the other no culture was made. Among the remaining five patients no culture was made in two, and the result is unknown or was negative in three. Of the sixty-seven empyemas known to be due to the pneumococcus, 74.6 per cent were cured by aspiration alone, and of those due to the hemolytic streptococcus, Streptococcus viridans and a staphylococcus, 59.6, 33.3 and 55 per cent, respectively, were so cured. In the case in which Bacillus pyocyaneus was found and in all of those of unknown etiology the patients recovered in the same manner. The rate of mortality for each organism isolated was: Pneumococcus, 7.5 per cent; Streptococcus haemolyticus, 28 per cent; Streptococcus viridans, 33.3 per cent, and Staphylococcus, 44.4 per cent.

The predominant rôle of the staphylococcus in our mortality, as already pointed out, is not yet fully apparent from these figures. A further analysis shows that in spite of the fact that it was the etiologic factor in less than one tenth of our patients, it caused one third of the deaths, and all of these infants were in the first year of life. Of the nine empyemas due to a staphylococcus six were in infants all under, or just, 1 year of age, with the actual ages 1½, 1½, 3½, 5, 11 and 12 months. Of these six infants, four, or 66.7 per cent, died. In the three remaining cases of Staphylococcus empyema, in patients 2, 2½ and 5 years of age, all the patients recovered following, respectively, one aspiration of 20 cc. of pus and a spontaneous rupture through a bronchus, one aspiration of 160 cc. of pus and two aspirations of 262 cc. of pus. In each of these three patients there was a pneumothorax. That the staphylococcus was a major cause of the higher mortality in the last two years is evident from the fact that while in 1928 there was only one Staphylococcus infection, and that in a child of 2½ years who recovered, in 1929 and 1930 there were eight such infections, four in each year, and of each four patients so infected two died (50 per cent) in the first year of life. A staphylococcus was

responsible for 33.3 per cent of our total mortality, and 80 per cent of the mortality in the first year of life, and caused no deaths among three patients so infected after the first year of life. Luck was with us in 1928 and against us in 1929 and 1930, and the two factors that were responsible for the change were the staphylococcus and early infancy, in combination. Without these two factors so combined our mortality would have been less in 1929 and 1930 (8.2 per cent) than in 1928 in spite of the fact that there were two institutional casualties due to measles in the last two years. This is all the more interesting since the staphylococcus does not appear at all, or only in a very minor rôle, in most recent statistics, a further illustration of the strange, and statistically important, variations of infection from year to year.

The relatively benign rôle of the pneumococcus, on the other hand, is shown both in the lower death rate (7.5 per cent) and in the effect of this factor on the comparative mortality in the three years of this series. In 1928, twenty-eight of thirty-three, or 85 per cent, of the empyemas were due to the pneumococcus, in 1929 twenty of thirty-one, or 64.5 per cent, and in 1930 eighteen of thirty, or 60 per cent. The figures for the last two years would probably be slightly higher if the organisms had been isolated in the five empyemas of unknown etiology, since most of them were doubtless due to the pneumococcus.

Nearly all of these patients have been followed up to the time of this report (November, 1931). There has been no recurrence of empyema in any instance, owing to an undrained or unabsorbed residue of pus. So far as we can determine by repeated clinical and roentgen examination, all of the children except one, who died many months later of chronic nephritis that antedated the empyema, are normal in every way, both locally and in general health. A drooping of the shoulder and a sinking in of the chest on the affected side, with a curvature of the spine away from the empyema, have usually persisted for a time but have always disappeared. The last signs to disappear have been a slight dulness to percussion with some suppression of breath sounds and a slight haziness and a thickened pleural line in the roentgen film on the affected side. The only serious complication encountered was a pericarditis with fluid in the pericardial sac in two instances. One of the patients recovered without local treatment; the other was operated on and drainage was instituted because of cyanosis and embarrassed heart action about one month after the diagnosis was made. The fluid was copious and clear and yielded no growth on culture. The empyema had healed by aspiration, and the child made a rapid and complete recovery and has been in robust health ever since. There were a number of cases of nephritis, but this condition was always present when the empyema first appeared. While the presence of

nephritis made us lean toward an earlier operation, we were unable to see any difference in the course of that disease in those who were operated on and in those who were not.

The process of healing of the empyemas, especially as shown in roentgen films, differed in no material way from that shown in the former paper.

Since our former publication several reports of fairly large series of cases of empyema have appeared in the literature.[3] Danna [4] reported the cases of thirty-five patients so treated, with only two deaths (5.7 per cent). There were, however, no children under 3 years and only six from 3 to 12 years of age. The rest of the patients were from 14 to 75 years of age. Danna attached great importance to the replacing of the pus withdrawn by a like amount of air. Ochsner and Gage [5] reported 79.2 per cent recoveries in twenty-six patients, all over 11 years of age, by aspiration and air replacement alone, with a mortality of 10.3 per cent. Their mortality with simple intercostal drainage was 12.2 per cent and with rib resection 13.2 per cent. Strong, of New Orleans, has reported to us personally a series of cases of thirty-seven children treated by aspiration and replacement by air with three deaths (8 per cent). Theoretically this procedure seems rational both from the standpoint of protection against puncture of the lung and from that of complete emptying of the pleural cavity. We have an open mind on this point, since we do not consider the former a serious complication and do not believe that the latter is necessary. Danna's [4] statement that "complete emptying of the pleural cavity" by this method "is essential to bring about a cure" is refuted by the fact that we have been able to obtain almost an equal result, when we take into account the age of the patients, by a method that practically excludes the possibility of "complete emptying" of the pleural cavity. We are convinced that fairly large amounts of pus can safely be left to absorption, and we have reason to believe that certain patients with limited empyema would get well without any treatment.

Of special interest is a revival of aspiration in France and Germany following the lead of Gralka.[6] In all of these reports, as shown even

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3. A very full list of references on the whole subject of empyema of the thorax is given by Ochsner, Alton, and Gage, Idys Mims: The Treatment of Acute Empyema Thoracis, with a Review of One Hundred Consecutive Cases, Proc. Internat. Assemb. Inter-State Post-Grad. M. A., North America **6**:261, 1931.

4. Danna, Joseph A.: The Treatment of Empyema by Aspiration and Air Replacement Without Drainage: Review of Thirty-Five Cases, J. A. M. A. **96**: 1453 (May 2) 1931.

5. Ochsner, Alton, and Gage, Idys Mims: Acute Empyema Thoracis, Ann. Surg. **94**:25 (July) 1931. This article also has an extensive bibliography on empyema.

6. Gralka, R.: Ueber die Behandlung von Pneumokokken Empyemen im Kindersalter mit Optochin, Monatschr. f. Kinderh. **23**:280, 1922.

in the titles of the papers, the favorable results have been attributed to the irrigation with, and instillation of, a solution of optochin base (ethylhydrocupreine) following aspiration. In some of the earlier reports this drug was said to have been given by mouth also. Ethylhydrocupreine is known to be a powerful pneumococcid in vitro, and therefore seemed indicated theoretically in attacking the pneumococcus in a comparable and easily accessible walled off cavity in the body. For this reason all of these authors have considered this treatment indicated and efficacious in pneumococcus empyemas only. The earlier reports of Gralka,[6] Leitner[7] and Woringer[8] have been summarized in our former paper. In the most recent and the most extensive report of the results of this combined method of treatment Woringer[9] stated that probably about sixty patients had been so treated, and gave details of his own results and those of his immediate colleagues in thirty-six cases of empyema in children. After aspiration the pleural cavity was irrigated with 0.5 per cent ethylhydrocupreine and a 5 per cent solution was instilled in amounts of 25 mg. per kilogram of body weight, the dose never exceeding 0.5 Gm. Twenty-four of Woringer's patients were cured by this method alone (66.7 per cent). Of the remaining twelve, five were operated on after repeated aspirations. There were six deaths (16.7 per cent). Woringer's enthusiasm over the results of this method of treatment leads one to the conclusion that his earlier experience with surgical procedures had been much less favorable. With a mortality somewhat higher than Danna's, Strong's, Ochsner and Gage's and our own, the assumed theoretical benefits from the use of ethylhydrocupreine do not seem to be confirmed in practice. This is all the more evident when one bears in mind that they employed the treatment only in empyemas due to the pneumococcus, in which results are most favorable by any treatment.

That the results obtained by aspiration, with subsequent operation in a small minority of cases, are far better than those obtained by surgical methods twenty years ago is evident to any one familiar with the literature. Within the last ten or fifteen years there have been developments in the treatment of empyema in children that make it necessary, however, to subject this procedure to a critical evaluation in the light of these developments. It is significant that in all recent statistics on this subject there is shown a marked tendency to a much

7. Leitner, Philipp: Ueber die Behandlung von Pneumokokken Empyemen im Kindesalter mit Optochin, Jahrb. f. Kinderh. **119**:227 (March) 1928.

8. Woringer, Pierre: Le traitement des pleurésies purulentes à pneumocoque par l'optochine, Arch. de méd. d. enf. **27**:713 (Dec.) 1924.

9. Woringer, Pierre: Les résultats du traitement de la pleurésie purulente par l'optochine, Rev. franç. de pédiat. **5**:60 (Feb.) 1929.

lower level of mortality and a level that is, moreover, becoming surprisingly uniform no matter what the underlying method of treatment. Thus, Danna,[4] Ochsner and Gage [5] and Strong reported, respectively, 5.7, 10.3 and 8 per cent mortality with aspiration and replacement by air; Graham,[2] 11.2 per cent in one hundred and twenty-one children with rib resection preceded by aspiration; Ochsner and Gage,[5] 13.2 per cent in fifty patients with rib resection and 12.2 per cent in forty-one patients with simple intercostal drainage, all over 11 and 60 per cent over 20 years of age; Hart,[10] 14 per cent in thirty-six children by means of a closed method with tidal irrigation and suction; Packard,[11] 2 per cent in fifty children with a closed method with six secondary operations; Woringer,[7] 16.7 per cent in thirty-six children with aspiration and the administration of ethylhydrocupreine, and subsequent operation in five patients, and the present paper, 12.8 per cent with aspiration and in about 14 per cent of patients subsequent operation. With results by such apparently widely differing methods varying possibly only within such limits as may well be imposed by differences in age, organism, coincidence, luck, and nonempyemal cause of death, it would seem probable that there is one factor that is responsible for this lowered mortality that is common to all methods. That factor, we believe, clearly lies in the recognition that empyema is not a condition requiring an emergency operation as it was once held to be. The old practice of immediate radical drainage whenever painstaking needling revealed the smallest amount of pus is rapidly dying out, but not as fast as it should. The danger inherent in open pneumothorax following early operation before there is time for fixation of the mediastinum, walling off and ripening of the pus and quiescing of the acute infectious process reaches its greatest height in early childhood and has been largely responsible for a staggering mortality in infancy in the past. This danger is avoided by aspiration for a time, with or without subsequent operation, and by other efficient closed methods, with or without preceding aspiration. The crowning proof of the value of delaying of open operation until more favorable conditions have been established by aspiration was given by the change in results during the World War, when the early mortality of from 30 to 70 per cent, in one report even 84 per cent, following immediate open operation for empyema among soldiers, was reduced later to 10 or 15 per cent when operation was preceded by an optimum number of aspirations. But as early as 1915 Wilensky,[12] in

10. Hart, D.: Empyema in Children. Report of Thirty-Six Cases Treated by Tidal Irrigation and Suction, South. M. J. **23**:823 (Sept.) 1930.

11. Packard, George B., Jr.: Empyema in Children, Surg., Gynec. & Obst. **53**:255 (Aug.) 1931.

12. Wilensky: Empyema of the Thorax, Surg., Gynec. & Obst. **20**:501, 1915.

an instructive series of two hundred cases, reported a lessening of mortality with each week that operation was delayed up to the seventh or eighth week, after which there was a rapid rise. While these figures are not meant to be taken as a guide they are at least significant. Further confirmation is found in the fact that among our thirteen patients who were operated on and who had all been subjected to aspiration for many weeks there was only one death, and that was due to tuberculous meningitis.

In the light of all of these recent observations and developments, what attitude may one reasonably adopt toward aspiration in the treatment of empyema in children? We should like to emphasize as forcibly as we know how that we are not now, and did not in our former paper, when results were most alluring, advocate aspiration as a sole routine method of treatment. We feel very strongly that there should not be any one fixed method of treatment of empyema in children any more than there should be any one fixed method of treatment of appendicitis or pyuria. We do believe that in all cases of empyema in children, regardless of age, the causative organism or the condition of the child, aspiration should be performed for a time, the length of time depending on the reaction of the child as to temperature, toxicity, local progress and general well-being. If the child improves after a few aspirations as measured by these criteria we continue to aspirate as long as things seem favorable, at intervals of from two to three days to a week or more, depending again on local and general reactions. In the majority of cases, after some experience, one can commonly tell after a few aspirations whether the child will get well within a reasonable time by that method alone. That 75 per cent of patients can be so cured has been fairly well established. If after a reasonable time and a reasonable number of aspirations we feel that the course of the disease seems unduly prolonged or uncertain we resort to open operation with simple incision and tube drainage, only occasionally to rib resection if it seems indicated because of inadequate intercostal space. To this we would make one exception. In spite of the fact that our early most favorable results in infancy and early childhood were not matched in the two succeeding years, we still feel that aspiration, or some other closed method, is the procedure of choice in the first two years of life and especially so in the first year.

The outstanding objection to aspiration that has always obtruded itself is the fact that it takes longer to obtain a cure than other methods. The average period of hospitalization in our series was about three months. Packard,[11] who rightly considers this fact "of some moment," gives us a basis for comparison with the time required by the closed method, which he thinks "apparently meets the greatest indication

in children." In his series of fifty patients "the average duration of the disease previous to operation was three weeks" and "the average duration of drainage was 46.1 days." Whether this period of 67.1 days is coextensive with the number of days of hospitalization we do not know. Graham [2] puts the length of time for complete healing after rib resection that has been preceded by a variable number of aspirations at about from three to four weeks. Again, it might be necessary to add several weeks to this to make it coextensive with the period of hospitalization that we have adopted as a measure. Many of our patients stayed much longer than necessary for the sake of assured observation, and in the case of those with good homes it is not always necessary to keep the child in the hospital continuously. The time element is in itself a serious matter and yet its disadvantages are to some extent offset by the unpleasant features of an operation, a scar, the discomfort of large dressings and discharging sinuses, to say nothing of the psychic trauma of frequent dressings and manipulations, as compared with that of the occasional almost painless aspiration if properly done.

There is a more serious aspect in the time element. No good pediatrician wants a child to stay in a children's hospital one day longer than necessary. Crossed infections are not wholly avoidable. In our series two deaths occurred from measles acquired in the wards. In infants the great danger of acquiring serious infections of the respiratory tract is well known.

It seems to us that these pros and cons should be carefully weighed in each individual case. There is general agreement that aspiration should be done for a time in all cases. The main difference in practice lies in the question of when to stop. We prefer to get the patient well without operation if progress is reasonably favorable. Others prefer to operate on all patients who do not get well promptly after a few aspirations. We have aspirated longer before resorting to operation, and we have so far no serious regrets. Perhaps the two points of view will ultimately merge in a midway point of agreement.

We have not intentionally slighted the so-called closed method of procedure in this discussion on empyema in children. This is obviously a continuous closed method, whereas aspiration is an interrupted closed method. They have much in common, and results have been, in general, much the same by both methods. There are, however, two serious handicaps in the "closed method." From all reports it does not always remain "closed." There is like unanimity that it requires a meticulous care that is not always, even rarely, obtainable, or feasible, and that makes it less "fool proof," to quote Ochsner and Gage, than is the open operation. We might perhaps add, "than is aspiration."

SUMMARY

1. Ninety-four consecutive cases of empyema in children treated by aspiration are reported. Sixty-eight (72 per cent) of the patients were cured without operation. Thirteen were operated on after a period of aspiration with one death due to tuberculous meningitis. The mortality was 12.8 per cent.

2. The significance of age, the organism, yearly variations of infection and the causes of death are discussed.

3. An attempt is made to evaluate the proper rôle of aspiration in the treatment of empyema in children.

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TUBERCULOUS PULMONARY INFILTRATIONS IN CHILDHOOD

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This study of sixty children showing tuberculous pulmonary infiltrations has been conducted over a period of five years. All the children included in the study have been followed for at least one year, and most of them for three and four years, except for three who died shortly after they were first seen. The patients either were examined in the clinic because of known contact with a case of open tuberculosis, or were admitted to the hospital suffering from an acute illness.

These children showing pulmonary infiltrations fall into three clinical groups: Group 1, children acutely ill with fever. Group 2, children who, though not acutely ill, are ailing; they may have a little fever, cough and poor appetite, and they may tire easily. (No patient gave a history of an acute illness suggesting pneumonia.) Group 3, children who are in good health with no symptoms whatever, and who do not give a history of an acute illness. The features common to all three groups are: (1) a strongly positive intradermal reaction to 0.1 mg. of tuberculin; (2) the presence in the roentgenogram of more or less extensive pulmonary infiltrations which are slow to clear, as demonstrated by serial x-ray films taken at intervals over a period of a year or more.

Sixty-five per cent of the children in the whole study gave a history of contact with tuberculosis. The three groups show a striking difference in the percentage of children giving a history of such exposure. As seen in table 1, group 3 gave a 100 per cent history of exposure. This is accounted for by the fact that all these healthy children were examined because of known contact with a case of open tuberculosis. The children in groups 1 and 2 came under observation because of illness, and were therefore unselected with reference to the history of exposure.

AGE DISTRIBUTION; RACE; ASSOCIATED LESIONS

The age range in this study was from 3 months to 13 years. There was no selection of the cases on an age basis, as both hospital and clinic admit children up to 13 years of age. There is, however, a

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predominance of children in the first half of childhood admitted to both clinic and hospital. Eighty per cent of the infiltrations occurred in children of 6 years and under. The age distribution was the same for the individual groups as for the series as a whole.

Study of group 3 frequently showed that several younger children of the same family had pulmonary infiltrations, as revealed by roentgenograms. The x-ray pictures of the older children of such a family often showed healed calcified lesions, undoubtedly the end-result of earlier pulmonary infiltrations. Table 2 shows the greater number of pulmonary infiltrations in the group from birth to 6 years of age.

TABLE 1.—*History of Contact*

	Number Cases	Contacts	
		Number	Per Cent
Group 1	29	14	48
Group 2	18	14	80
Group 3	13	13	100

TABLE 2.—*Age Distribution (Years)*

	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13
Number of cases	6	8	6	11	5	13	4	4	1	1	0	0	1

TABLE 3.—*Associated Lesions*

	Large Mediastinal Glands	Cervical Adenitis	Phlyctenular Conjunctivitis	Dactylitis	Erythema Nodosum	Pleural Effusion	Infected Tonsils	Bronchiectasis
Number of cases	26	5	3	1	1	5	35	1

Race.—Negroes were 21 per cent of the group. This is considerably higher than the percentage of Negroes in the hospital and clinic.

Associated Lesions.—Other lesions of a tuberculous nature were present in addition to the infiltrations in the lungs. Roentgen evidence of enlarged tracheobronchial lymph nodes occurred in twenty-six cases. The tuberculous as well as the nontuberculous associated lesions are presented in table 3.

CLINICAL GROUPS

The grouping of the cases in this series of sixty children showing pulmonary infiltrations is based on the similar clinical picture presented by the cases within each group. This grouping is an aid to treatment and prognosis; it is not a classification.

Group 1.—This included twenty-nine cases of tuberculous pneumonias (see report of cases 1 to 4). This group of infiltrations was characterized by a febrile illness of acute onset, sometimes preceded by a history of poor health. There was a high remittent fever, lasting from one to three weeks and falling by either crisis or lysis; the temperature then ranged around 100 F., with an occasional rise to 101 F. for several months. There were periods of recurrence of the high temperature, which were in some cases associated with roentgen evidence of a spread of the lesion.

The physical signs were unusually well marked, being those of a consolidation, dulness, diminished or bronchial breathing and râles—the last are not as numerous or persistent as in the nontuberculous pneumonias. The physical signs not infrequently continued for some weeks and occasionally for months after the temperature had subsided. In some cases from the onset the physical signs were inconspicuous.

In spite of a high temperature and physical findings of considerable extent in the lungs, the children did not appear very toxic. A cough was usually present; at times this was severe and paroxysmal. Sputum, when present, was usually swallowed.

The x-ray pictures showed a pulmonary infiltration which varied greatly in its extent and density. Shadows of enlarged tracheobronchial lymph nodes were often visible because, owing to their large size, the nodes bulged out into the air-containing parenchyma. These were most often present in the left hilar region, or to the right of the mediastinum (fig. 2*B* and *C*).

The differential diagnosis between the tuberculous and nontuberculous pneumonias will be discussed in detail later.

Group 2.—This included eighteen cases (see cases 5 and 6). The children in this group gave no history of an acute onset, but were seen because they were ailing. They had poor appetites and tired easily. They were thin, or did not gain. Occasionally there was a temperature of from 100 to 101 F. for a few days at a time. Many gave a history of frequent coughs and colds. This group of symptoms is in no way characteristic of tuberculosis, as it is commonly associated with chronic infections of the upper respiratory tract. The intradermal test, however, was positive in all cases.

The x-ray picture of the lungs revealed a pulmonary infiltration which cleared slowly over a period of many months, as demonstrated by films taken every three months. Roentgen evidence of enlarged caseous mediastinal glands was not infrequently present. The physical signs were not marked. Slightly diminished resonance and slightly diminished breath sounds were the signs most frequently found. Râles were usually absent; often there were no physical signs at all.

Fig. 1 (case 1, group 1).—*A* (May 4, 1928), infiltration of base of right lung; large gland to the right of the mediastinum. *B*, seven months later (Jan. 21, 1929). The infiltration is clearing. A large gland with pleural thickening is visible to the right of the mediastinum. *C*, seventeen months later (Oct. 30, 1929). Strands of fibrosis in the base of the right lung; thickened pleura over the large gland still present to the right of the mediastinum. This was still present at the time of the last film (Oct. 27, 1930). No evidence of calcification is visible.

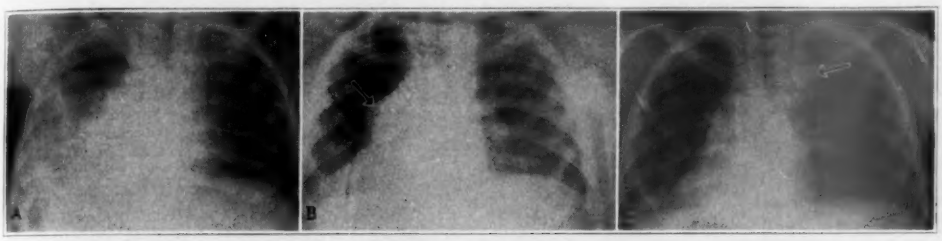

Fig. 2 (case 2, group 1).—*A* (July 5, 1927), infiltration of the lower left lobe and a wide mediastinal shadow, especially to the left. *B*, six weeks later (Aug. 16, 1927). The infiltration is clearing. A large caseous bronchiopulmonary gland is seen in the left hilus at the end of the second rib, anteriorly. *C*, five months later (Dec. 28, 1927). The infiltration in the base of the left lung is clearing. There is slight infiltration in the right costal phrenic angle. A large caseous gland is seen to the right of the mediastinum.

Fig. 3 (case 3, group 1).—*A* (Sept. 1, 1928), infiltration overlying the right hilus. *B* (Jan. 23, 1929), dense infiltration throughout the right upper lobe. This extension was accompanied by an acute exacerbation of symptoms. *C* (Oct. 29, 1929), the infiltration of the right upper lobe is clearing. There is still infiltration over the right hilus. This was still present on Oct. 21, 1930.

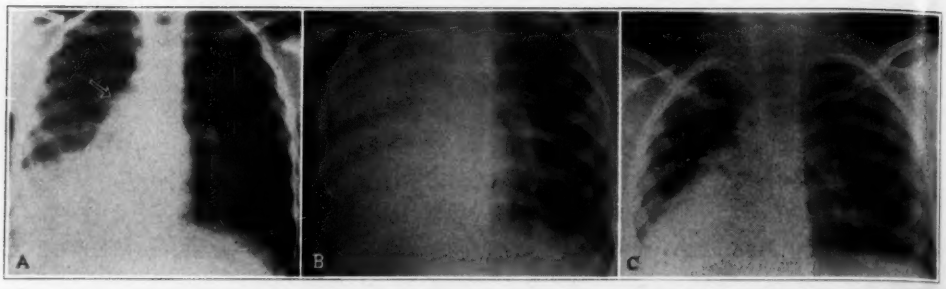

Fig. 4 (case 4, group 1).—*A* (June 19, 1929), infiltration in the base of the left lung; an enlarged bronchiopulmonary gland in the left hilus. *B* (June 24, 1929), shadow over the entire left lung, obscuring the heart. *C* (June 3, 1930), shadow still present in base of left lung. The heart and mediastinum are displaced to the left. There is persistent atelectasis of the left lower lobe.

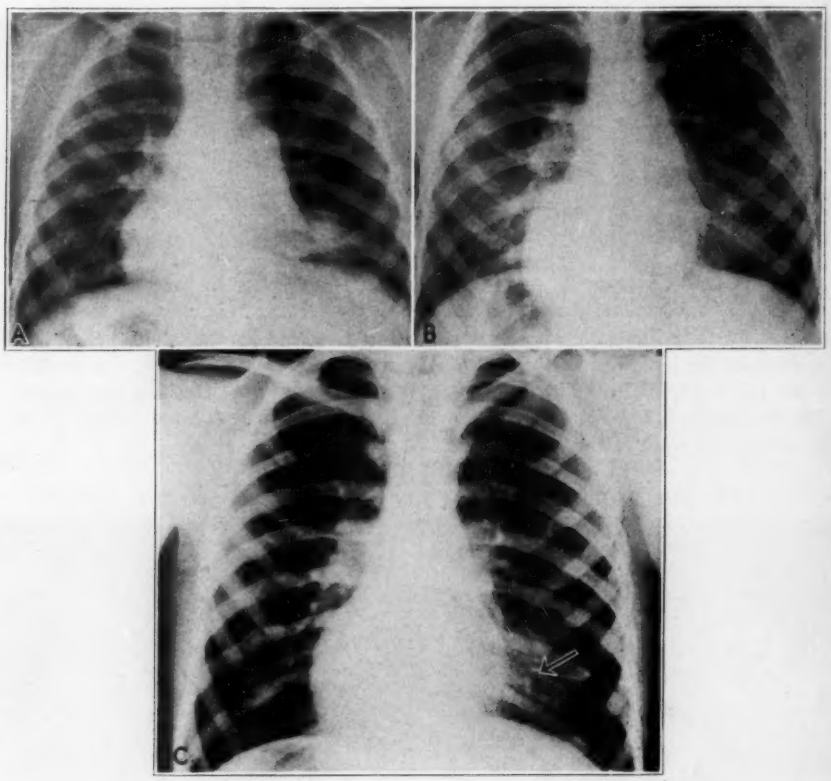

Fig. 5 (case 5, group 2).—*A* (March 7, 1927), infiltration in the lower right lobe adjacent to the heart. *B*, two years later (May 27, 1929). Strands of fibrosis and beginning calcification. *C* (Oct. 1, 1931), calcification, with the primary focus in the base of the right lung. No calcification is yet visible in the hilar glands.

The associated tuberculous lesions mentioned in table 3 nearly all occurred in children of this group. Chronic infections of the upper respiratory tract were present in a very large proportion of these children. The relation of this active chronic infection to the symptoms present in this group of cases and the treatment of this chronic infection will be discussed later in this paper.

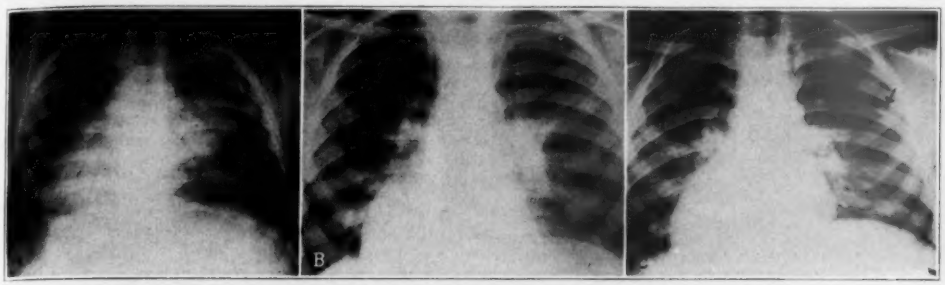

Fig. 6 (case 6, group 2).—*A* (Aug. 17, 1927), infiltration in the right lung overlying the hilus and extending out into the middle lobe. *B*, eleven months later (July 30, 1928). The infiltration is clearing; fibrous strands leading to the hilus are seen. *C* (Feb. 9, 1931), the infiltration has cleared. There is a calcified area in the second interspace, the primary focus. Calcification is visible in a gland in the right hilus.

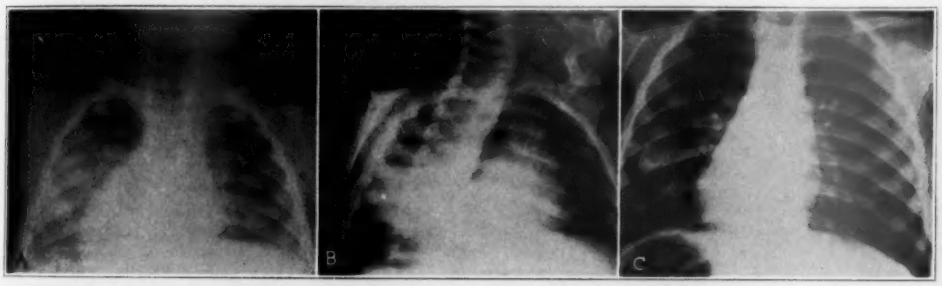

Fig. 7 (case 7, group 3).—*A* (Sept. 30, 1929), homogeneous infiltration in middle portion of the left lung. *B* (Sept. 30, 1929), left anterior oblique view, showing infiltration in the posterior portion of the left lung. *C*, sixteen months later (Jan. 26, 1931). The infiltration has cleared and calcification is well developed in the fourth interspace anteriorly.

All children in this group were cared for at the sanatorium some time during the period of observation, and in some cases an examination of the sputum secured by gastric lavage was performed there. Three cases gave positive results for tuberculosis on inoculation of guinea-pigs.

In one child included in this group, while at the sanatorium and apparently progressing satisfactorily, tuberculous meningitis developed. Autopsy showed a very large caseous gland to the right of the trachea. The gland was adherent to the pleura up to the apex of the right lung. The caseous process had extended through the capsule of the gland into the lung tissue. There was also in the axillary region of the right upper lobe a subpleural, circumscribed, soft, caseous area, 1.5

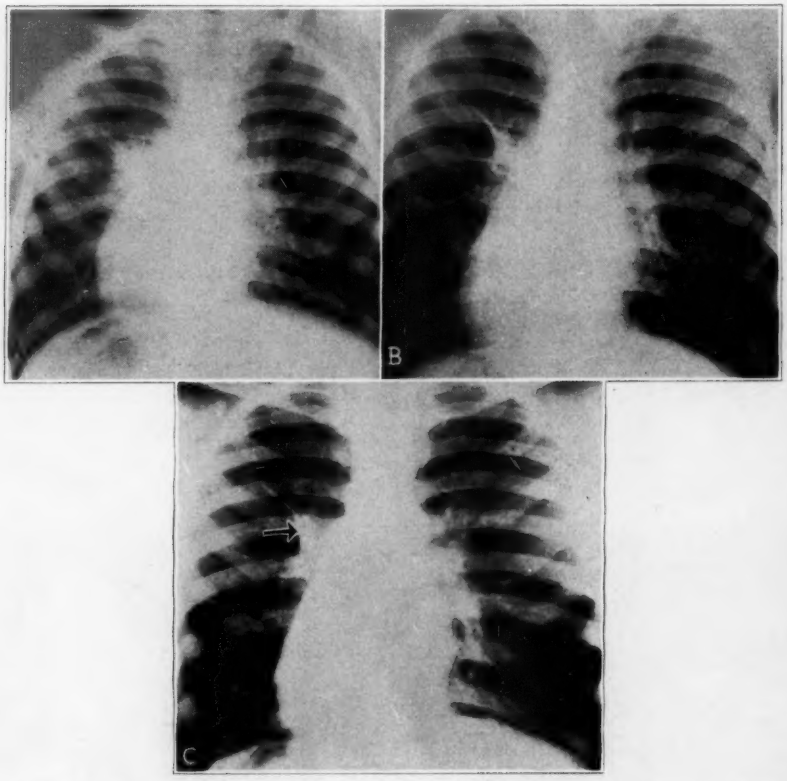

Fig. 8 (case 8, group 3).—*A* (Aug. 17, 1927), infiltration overlying the left hilus; slight infiltration over the right hilus; blurring of the left cardiac margin. *B* (Sept. 8, 1930), a decrease in the infiltration, with fibrous strands leading into the left hilus. *C* (June 29, 1931), calcification in the left hilar glands. Fibrous strands are still present.

cm. in diameter, which was interpreted as a primary focus. The x-ray picture showed an irregular shadow to the right of the mediastinum extending to the hilar region. A faint shadow was present in the second right interspace, well out to the periphery, which corresponded to the primary focus found at autopsy. This shadow in the x-ray picture was overlooked until the autopsy revealed the lesion.

Group 3.—This group includes thirteen apparently healthy children brought for examination because of a history of contact (see cases 7, 8 and 9). Their tuberculin tests were positive, and the x-ray pictures revealed pulmonary infiltrations, often of considerable extent. Physical signs were usually absent, and were of no aid in detecting these infiltrations. In all cases a history of exposure to tuberculosis was given. The only associated tuberculous lesions in this group were

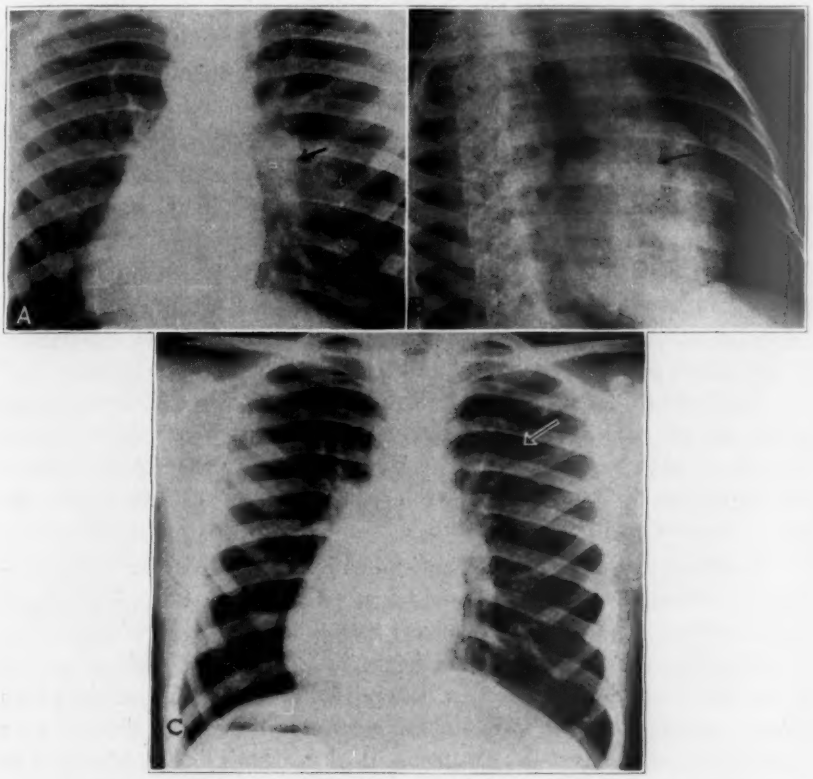

Fig. 9 (case 9, group 3).—*A* (Sept. 14, 1929), slight infiltration over the right hilus. There is the shadow of a gland at the margin of the left hilus between the seventh and eighth ribs posteriorly. *B* (Sept. 14, 1929), left anterior oblique view showing the infiltration extending anteriorly into the right lung. The shadow of a large gland is seen through the heart shadow. *C* (May 28, 1931), the infiltration over the right hilus has cleared. The primary focus is in the second interspace on the right. No calcification is visible in the mediastinal glands.

enlarged mediastinal glands which were present in seven of the thirteen cases. As in groups 1 and 2, infected tonsils and infections of the upper respiratory tract were very common. Unfortunately, in none

of the cases in this group was material from gastric lavage examined for tubercle bacilli. All the children in this group were cared for at home and were neither in the hospital nor in the sanatorium.

COMMENT

Pathology.—The clinical picture of the tuberculous pneumonias in group 1 is probably the same as that variously reported in the literature as splenopneumonia, gelatinous inflammation and perifocal inflammation. The condition described by Eliasberg as epituberculosis clinically approximates cases here placed in group 2. As already stated, patients in groups 2 and 3 at no time had had pneumonia. The pulmonary lesions in the children of all three groups were in all probability of the same pathologic nature, the difference being one of degree rather than kind, at least in the early stages of the tuberculous pneumonias. Groups 2 and 3 represent a lesser reaction on the part of lung tissue, and a lesser or absent constitutional reaction on the part of the patient. That there is any essential difference in the fundamental pathologic process in the lungs in the three groups is not maintained. They represent rather a more or less severe degree of reaction of the person to the tuberculous infection. The infection manifests itself as a local reaction in the lungs, and may or may not give rise to constitutional symptoms of toxemia. The extent and character of this reaction depend on such variable factors as dosage and virulence of the infecting organism, the frequency of such infection and the character of the patient's reaction to the infection.

Roentgen Observations.—The infiltrations found in the x-ray pictures in these cases were in various parts of the lungs. They were circumscribed or involved a large area. The density varied greatly. In the x-ray picture alone there is no indication as to which clinical group the lesion belongs in. In general, however, the lesions in group 1 were more extensive and showed a greater degree of density than those of groups 2 and 3. In group 1, also, cavities developed in two cases, but later disappeared. Involvements of the pleura also were more frequent in group 1. Shadows that overlie the hilar area can be shown to be in the parenchyma of the lung, lying either anterior or posterior to the hilus. This is brought out by the use of the oblique position, which is very useful in the study of tuberculosis of childhood, as demonstrated by McPhedran. These lesions cleared very slowly, as shown by serial films taken at intervals of a few months, and carried on over a period of several years. As the infiltration cleared, strands of fibrosis were often seen, which later disappeared. The clearing proceeded from the periphery toward the hilus. Often as the clearing proceeded, a central dense area emerged that went on to calcification

and the formation of a primary focus (case 6). The majority of cases, however, cleared completely by resolution, leaving no evidence of calcification in the parenchyma or the hilar glands. Calcification in the hilar glands may appear late, as healing and calcification proceed very slowly. In some of the early cases calcification appeared in the hilar glands after three years.

In three of the cases there was atelectasis of a lobe of the lung in addition to the infiltration (case 4). The atelectasis is suggested by the density of the shadow, the elevation of the diaphragm and the displacement of the heart and mediastinum to the opposite side. The atelectasis may be brought on by pressure of an enlarged gland on a bronchus, or by a plug of mucus. In group 3, collapse of the upper left lobe occurred in a child 8 months of age. Serial films showed this to be cleared up in a few months.

Roentgen evidence of enlarged tracheobronchial lymph glands is frequently associated with the pulmonary infiltrations. It was present in twenty-seven cases, 45 per cent of the series. It was more frequent in the Negro, Mexican and Oriental children than in the white children. Such enlarged glands may not be visible at all times in the course of the disease, being obscured by the overlying infiltration. In case 2 the gland in the left hilus became visible as the infiltration cleared, and a few weeks later a large gland became visible to the right of the mediastinum. I do not feel from my observations that the presence of these enlarged glands adds greatly to the gravity of the prognosis. Enlarged glands were visible in 52 per cent of the cases in group 3, in 52 per cent in group 1 and in 16 per cent of the cases in group 2.

Differential Diagnosis.—It is important to differentiate the tuberculous pneumonias from other pneumonias because of the need for longer convalescence and continued observation in the tuberculous pneumonias. This differentiation cannot always be made at once. Pneumonias in which there is a positive intradermal reaction must be considered tuberculous until proved otherwise, if the roentgen evidence of pulmonary infiltration persists after the clinical illness subsides. The presence in the roentgenogram of large, tracheobronchial lymph nodes is strong evidence that the infiltration is tuberculous, as these glands are rarely if ever enlarged in other pneumonias. A history of known exposure to tuberculosis is added evidence. In tuberculous pneumonias, the patient is not as toxic as in other pneumonias. Examination of sputum secured by gastric lavage at times gives conclusive evidence of the tuberculous origin of the pneumonia. In the unresolved pneumonias and so-called fibroid lungs, râles are numerous and persistent. They are more often absent in the later stages of a tuberculous infiltration.

Examination of the sputum secured by gastric lavage should always be done. At least two specimens should be secured and examined directly for tubercle bacilli, as well as inoculated into a guinea-pig. This procedure was not followed in the earlier cases, nor was such sputum obtained from any child in group 3, as these children were not in the hospital. Fourteen of the sixty cases showed positive sputums; four of these showed tubercle bacilli on direct examination, and ten gave positive results on inoculation of guinea-pigs with sputum obtained by gastric lavage. In some cases the gastric lavage was done during the stage of convalescence, when the cough was slight. Evident sputum was present only in the one case that was associated with a bronchiectasis. Poulsen recently reported a high percentage of positive sputums obtained by gastric lavage in children suffering from pulmonary tuberculosis, even when roentgen indications were slight.[1] He found that forty-one of sixty-eight children under 3 years of age had tubercle bacilli in the sputum, whereas only twelve of forty-eight children over 3 years of age had positive sputum. Further work in this direction will give information about the nature of the lesion in this type of pulmonary infiltration.

Chronic Tonsillar Infections.—Chronic foci of infection of the upper respiratory tract were frequently present in the entire group of sixty children. Four children had had tonsils removed before the first examination, and of the remaining fifty-six patients, forty-seven had large, infected tonsils. In group 2, eight children had undergone tonsillectomies while the pulmonary infiltration was still present. These tonsillectomies were done because of repeated acute colds and sore throats and the belief that the focus of infection in the upper respiratory tract was accountable, in part at least, for the symptoms present. There was usually marked improvement in the general health; the weight increased, and the appetite improved after the tonsillectomy. There was no case that reacted unfavorably to the operation. All operations were done under ether anesthesia. The tonsillectomy was not performed until after the child had been under observation for a considerable period of time and there was definite belief that the symptoms were due to the infected tonsils rather than to tuberculosis. The same procedure was followed in groups 1 and 2. In group 1, nicety of judgment was required to determine when to remove the tonsils. Tonsillectomies should never be performed until the stage of convalescence, after the fluctuations of temperature have subsided and roentgenograms show marked clearing, and only then if the child's general improvement has come to a standstill on the sanatorium routine. At such a period a

1. Poulsen, V.: Pulmonary Tuberculosis in Children, Am. J. Dis. Child. **41:** 783 (April) 1931.

temperature of 100 F. will frequently persist for months, owing to a tonsillar infection. Seven children in group 1 had tonsillectomies performed during the stage of convalescence, while roentgen evidence of pulmonary infiltration was still present. Under no circumstances are tonsils removed unless I feel certain that the symptoms present are due to tonsillar infection. The question legitimately presents itself as to whether the symptoms present in the children of group 2 do not arise more frequently from the associated chronic infection in the upper respiratory tract rather than from the pulmonary lesion.

It is my belief that children are definitely delayed in their recovery from juvenile tuberculosis and that their stay in the sanatorium is prolonged by the failure to remove infected tonsils. The infected tonsils are frequently responsible for the symptoms that are attributed to the tuberculous infection in the lungs. If care is taken as to the time and the manner of operation, no harm has been found to result, and marked improvement in the general health follows the tonsillectomy.

Treatment.—The first consideration in treating all types of juvenile tuberculosis is, of course, to separate the child from the source of its infection. Every effort was made to do this. Practically all children in group 1 needed hospital or sanatorium care for a considerable period of time. They needed a modified routine of rest and careful observation for a further period following the subsidence of the fever. It is not possible to keep all such cases in the sanatorium until the roentgen evidence of infiltration has completely cleared, as this may last over a year or two. Supervised care at home, and later at school, will suffice.

The children in group 2 did best when they had a period of sanatorium care followed by a well supervised home routine.

The children in group 3 had not gone to a sanatorium, nor had they been put to bed at home. They have had careful supervision at home, where they were put on the proper routine for their age. This included an early bed hour and from two to three hours of rest during the afternoon. They were advised as to an adequate diet, and all were given cod liver oil. The children attended the clinic regularly, and a careful watch was kept on their general health and development. Foci of infection were eliminated. The older children went to school. When possible, rest during the afternoon was arranged for them at school.

As stated previously, families with several small children who had been heavily exposed to a case of tuberculosis often showed two or three cases of pulmonary lesions in the younger children that were classed as group 3. Obviously it would be impossible for a mother of the clinic class to keep them all in bed, even for a short period. Experience in caring for this type of case has shown that total rest in bed

is not necessary. Good, ordinary care is sufficient to enable these children to overcome the infection without any clinical evidence of the disease manifesting itself.

To summarize the points in the treatment of juvenile tuberculosis, there is, first, the separation of the child from the source of infection; second, supervision of the routine at home as to rest, diet, school, play, etc.; third, the provision of sanatorium or hospital care in cases needing it; fourth, the continuous observance of cases in the clinic for several years; fifth, the removal of foci of infection when such infection is interfering with a child's general health, and sixth, observation of the progress of the pulmonary lesions through serial x-ray pictures.

Prognosis.—The prognosis in tuberculous pulmonary infiltrations in childhood is good provided they are detected early and provided reinoculation is prevented by removing the child from the source of infection. The children in this study were, with few exceptions, separated from the original source of contact after the first examination. In this series of sixty cases, one child in group 2 contracted tuberculous meningitis and died. In addition, there were three fatal cases in group 1. These three patients were under 3 years of age, and when first seen had a widely disseminated caseous bronchial pneumonia. Two had cavitation, and all died within two months after their admission to the hospital. These three fatal cases represent the progressive lesion of acute tuberculous pneumonia. Probably the progressive character of the lesion was due to repeated massive infections. In these three cases there was a history of illness for several months. The children were emaciated and had a cough and positive sputum. They showed severe sweating and a high temperature. This is the stage of tuberculous pneumonia that has been generally recognized, and that gave rise to the conception that tuberculous pneumonia is highly fatal.

The clinical picture described under group 1 as characteristic of tuberculous pneumonia has frequently passed as a nontuberculous infection, and the frequency of the tuberculous pneumonias that have a good prognosis has not been recognized. The conception that tuberculous pneumonia in young children is usually fatal must be modified. The course of the disease, as shown in this series, is good provided there is not repeated massive infection.

SUMMARY

1. Sixty cases of tuberculous pulmonary infiltration are reported. They are divided into three clinical groups according to their symptom complex: (1) children with acute tuberculous pneumonia; (2) children who were not well, but who showed no evidence of an acute illness, and (3) children in good health.

2. Eighty per cent of the cases with pulmonary infiltrations occurred in children under 6 years of age.

3. Tuberculous infiltrations in the lungs are characterized by their chronicity, as demonstrated by serial x-ray pictures. In this respect they can usually be differentiated from the nontuberculous infiltrations.

4. Serial x-ray films are absolutely necessary in the study and care of juvenile tuberculosis.

5. Physical signs, except in the acute stage of tuberculous bronchopneumonias, are of little help in determining the presence of a tuberculous infiltration in the lungs of children.

6. All the children with pulmonary infiltrations had positive intradermal reactions.

7. A history of contact was present in 65 per cent of the cases here reported.

8. Chronic infections of the upper respiratory tract were present in a very large number of the cases. A tonsillectomy was indicated in selected cases.

9. Acute tuberculous pneumonias are more frequent than is generally recognized. They have a good prognosis if seen early, and if repeated infection is prevented by separation of the child from the source of infection.

REPORT OF CASES

CASE 1.—I. S., aged 5 years, was admitted to the hospital on April 15, 1928, with the history of contact with an uncle suffering from tuberculosis. An intradermal test with a 1:1,000 dilution of tuberculin was positive. The patient had been ill at home for two months with fever and cough, which began as an acute cold. His temperature was 104 F. on admission. There were dyspnea and an irritating cough. At the base of the right lung there were flatness, bronchial breathing and coarse moist râles. Thoracentesis was performed on April 17, 1928, yielding 5 cc. of yellow opaque fluid, which gave positive results on inoculation into a guinea-pig. The temperature subsided on May 16, 1928, to 100 F. It remained around that level until the patient's discharge, on June 17. The patient was cared for at home, and was in good health on May 1, 1931.

CASE 2.—J. G., a Negro boy, aged 7 years, was admitted to the hospital on July 5, 1927, with fever and cough which began acutely four weeks before. The grandmother was suffering from tuberculosis. An intradermal test with a 1:1,000 dilution of tuberculin was positive. The temperature on admission was 102 F. The patient was not very toxic. Physical signs at the base of the left lung were dulness and diminished breath sounds. Thoracentesis on July 7 yielded 10 cc. of yellow opaque fluid; inoculation of guinea-pigs gave negative results. The temperature diminished to about 100 F. by August 7, when the patient was transferred to Arroyo Sanatorium. There he had a low grade fever until about April, 1928. The physical signs completely disappeared by February, 1928. The patient was discharged in January, 1929, and was in excellent health when last seen.

CASE 3.—E. G., a boy, aged 21 months, was admitted to the hospital on Aug. 31, 1928, with apparently an acute infection of the upper respiratory tract and otitis media. There was a history of contact with a case of open tuberculosis. An intra-

dermal test with a 1:1,000 dilution of tuberculin gave positive results. The temperature was 104 F. for five days, then continued around from 102 to 100 F. until the patient was discharged, on October 12. There were no physical signs in the chest on admission. On September 5, there were slight dulness at the base of the right lung, with diminished breath sounds (fig. 3*A*). The patient was transferred to the sanatorium on October 12. On December 22, a high temperature developed. There were dulness and bronchial breathing over the right upper lobe anteriorly and posteriorly, with râles. Cough was present. The patient was not very toxic. The fever continued for several months. The patient remained in the sanatorium until Feb. 16, 1930. While there, he underwent a tonsillectomy, on Oct. 9, 1929. He was in good health in October, 1930.

CASE 4.—M. H., a girl, aged 7 years, was admitted to the hospital on June 7, 1929. There was no known history of contact. An intradermal test with 0.1 mg. of tuberculin gave positive results. The patient had had cough and fever for one week, but had not been well for a year. On her admission to the hospital, her temperature was 104 F. It remained high for three weeks. On June 23, 1929, physical signs were present over the left side of the chest; anteriorly breath sounds were absent and there was slight dulness; posteriorly on the left, the breath sounds were diminished; the percussion note was dull; there were no râles. The heart was not displaced. The left side of the chest moved but little. Cough was productive. Sputum obtained from gastric lavage gave positive results on inoculation into a guinea-pig. The patient was sent to the sanatorium on July 7, 1929. There she continued to have fever for several months, and had a temperature up to 101 F. off and on until July, 1931. In April, 1931, the physical signs were diminished breath sounds anteriorly, and in the axilla the percussion note was slightly dull. Posteriorly, loud tubular breathing and dulness at the base of the left lung were noted. There were a few dry crepitant râles anteriorly and posteriorly. Owing to repeated infection of the upper respiratory tract and very large tonsils, she had a tonsillectomy in July, 1931. She was doing well at home when last observed.

CASE 5.—G. J., a boy, aged 3 years, was examined in the clinic on March 5, 1927, because of exposure (there was a history of heavy contact). Except for frequent colds he was considered well. An intradermal test with a 1:1,000 dilution of tuberculin gave positive results. Examination gave negative results otherwise, except for large infected tonsils. The patient was given three hours of rest during the afternoon, and put to bed at an early hour. He did well until November, 1928, when he ran an afternoon temperature of 100 F., ate poorly, was tired, and did not gain. Roentgenograms showed little change from the condition in March, 1927. He was put to bed, and in August, 1929, was sent to the sanatorium. Because of frequent colds he had a tonsillectomy in November, 1929. He left the sanatorium in January, 1930. He was in good condition in April, 1931.

CASE 6.—J. L., a boy, aged 3 years, was first examined in August, 1927, because of contact with a tuberculous father who was at home. The patient was poorly developed and thin. His appetite was poor. He tired easily, and had many colds with cough. The tonsils were large and infected, and there was a profuse nasal discharge constantly. The lungs showed slight dulness, with diminished breath sounds at the base of the right lung. There were inconstant râles, but no fever. He was given three hours of rest during the afternoon, and put to bed at 6 p. m. He made little improvement, and had many colds. The family refused sanatorium care until November, 1928, when he was sent to the sanatorium. Improvement was slow. In June, 1929, while at the sanatorium, he underwent a tonsillectomy. After

this he improved in general health, weight and appetite. He was discharged in September, 1929, and was in good condition in April, 1931. There were three children in the family with similar lesions.

CASE 7.—V. C., a white girl, aged 10 months, was brought for examination on Sept. 30, 1929, because of exposure (the mother had tuberculosis). She was a healthy, well developed baby. There were no abnormal physical findings. She was cared for by a foster mother and did well. An intradermal test was positive. The infiltration gradually cleared. In March, 1930, she was fussy for a few weeks and would not eat; an afternoon temperature was noted occasionally, up to 101 F. Roentgenograms showed no change, and no physical findings were found in the lungs. When seen again in July, the patient was well, and continued so up to the time she was last observed (April, 1932).

CASE 8.—E. L., a boy, aged 5 years, was first seen in the clinic on Aug. 25, 1927. He was brought for examination because of a history of exposure (a tuberculous father lived at home). He was poorly nourished, being 2 pounds (0.9 Kg.) underweight, and had frequent colds and large infected tonsils, but was otherwise well. He was given two hours rest at home in the afternoon, and went to bed at 7 p. m. He went to school and gained slowly in weight. A tonsillectomy was done on June 8, 1929. His general health improved after this, and he had fewer colds, but he was always underweight. Owing to poverty, there was inadequate food in the family. In spite of this the pulmonary lesion healed and calcification occurred.

CASE 9.—M. C., a girl, aged 7 years, came for examination because of exposure (a sister had open tuberculosis). She was in good health without symptoms except for being slightly underweight. There were no abnormal physical signs in the chest. She continued at school, with rest during the afternoon and an early bed hour. She has continued in good health up to the present (May 28, 1931).

Dr. William Sargent cooperated in the roentgenologic work of this study.

APPARATUS FOR THE QUANTITATIVE COLLECTION OF URINE AND OF STOOLS IN MALE INFANTS

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The accurate investigation of water and mineral balance in young infants is frequently hindered by losses or admixture of samples during the collection of urine and stools. Apparatus designed to decrease these difficulties should automatically separate the stools and urine, announce the act of voiding by an audible signal and make possible the reading of the volume of each specimen of urine before addition to the total sample.

The outfit used at the New York Nursery and Child's Hospital consists of parts devised to fulfil these requirements. The mattress is a modification of the many types that have already been used,[1] and was suggested to us by Gamble.[2] The specifications are given in the photograph and legend (fig. 1 *A*). A local mattress manufacturer can copy or modify these dimensions to meet individual requirements.

The metabolism mattress is placed in the bed on top of the regular mattress to prevent drafts from coming upward against the infant (fig. 2). The bed should be of a type that permits elevation of the head end of the springs.

The large end of the pear-shaped hole accommodates the enameled bowl used to collect the stools (height and diameter of bowl are 4¾ inches [12 cm.]). These containers are more easily inserted and withdrawn without disturbing the infant if a removable wedge is built into the mattress at one side of the hole. This type of construction reduces the firmness and durability to such an extent that we prefer the solid mattress. The constricted end of the hole is placed toward the foot of the bed and allows the downward egress of the urine collection tube.

From the Department of Pediatrics, Cornell University Medical College, and the New York Nursery and Child's Hospital.

1. Bendix, B.: Beiträge zum Stoffwechsel des Säuglings, Jahrb. f. Kinderh. **43**:23, 1896. Bendix, B., and Finkelstein, H.: Ein Apparat für Stoffwechseluntersuchungen am Säugling, Deutsche med. Wchnschr. **26**:672, 1900. Schabad, J. A.: Ein Apparat zum Sammeln von Harn und Kot für Stoffwechseluntersuchungen bei Kindern, Arch. f. Kinderh. **48**:402, 1908. Talbot, F. B.: Apparatus for Metabolism Experiments in Male Infants, J. A. M. A. **53**:1818 (Nov. 27) 1909. Du Bois, Eugene F.: An Apparatus for the Collection of the Excreta of Infants, Am. J. Dis. Child. **2**:415 (Dec.) 1911. Howland, John, and Cooke, Robert A.: A Metabolism Bed for Infants, Am. J. Dis. Child. **2**:419 (Dec.) 1911.

2. Gamble, James L.: Personal communication.

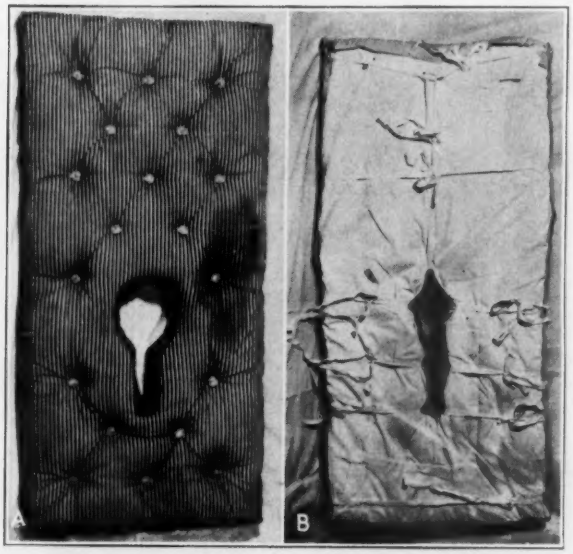

Fig. 1.—*A*, the metabolism mattress and special cover. The outside dimensions of the mattress are determined by the size of the bed. The thickness is 5 inches (12.7 cm.). The pear-shaped hole is 13 inches (33 cm.) long, equally divided between the two portions. The diameter of the upper half is 6½ inches (16.5 cm.), of the lower half about 2 inches (5 cm.). *B* shows the back of the covered mattress and the method of fastening the cover with tapes.

Fig. 2.—The metabolism bed with infant and collection apparatus in position.

The mattress covers are made of firm muslin to protect the entire front of the mattress and line the orifice. Each cover is held in position by tapes sewed along the free margins at corresponding points and tied across the back of the mattress (fig. 1 *B*). A chest binder 6½ inches

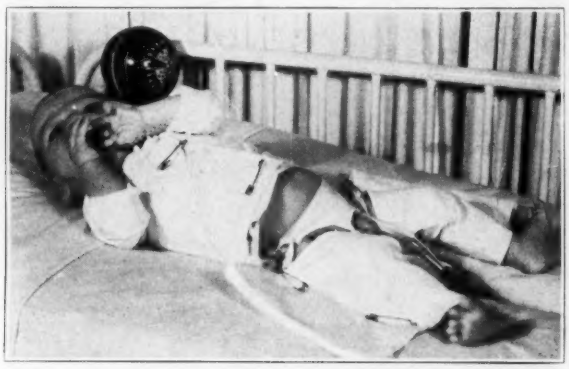

Fig. 3.—Method of securing partial restraint of the infant on the metabolism mattress. The chest binder is sewed to the mattress cover. The legs are loosely held by towels. The stool basin lies below the urine collection tube in the orifice in the mattress. Note the distinct downward course of the urine collection tube and its egress between the two mattresses.

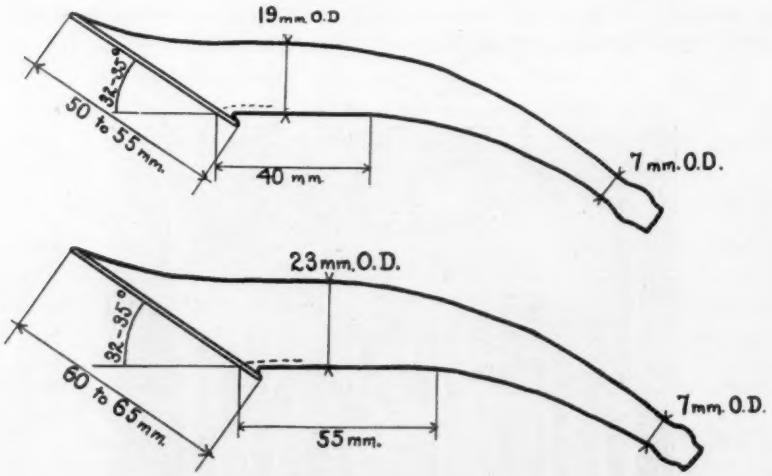

Fig. 4.—Diagram of the urine collection tubes. The margin flare is at least from 4 to 5 mm., and the walls are 1.5 mm. thick.

(16.5 cm.) wide is sewed to the front of the cover, beginning 1½ inches (3.8 cm.) above the orifice. The attachment of the binder to the cover should be sewed on the bias to conform to the taper of the infant's back (4½ inches [11.3 cm.] wide at the upper end and 2½

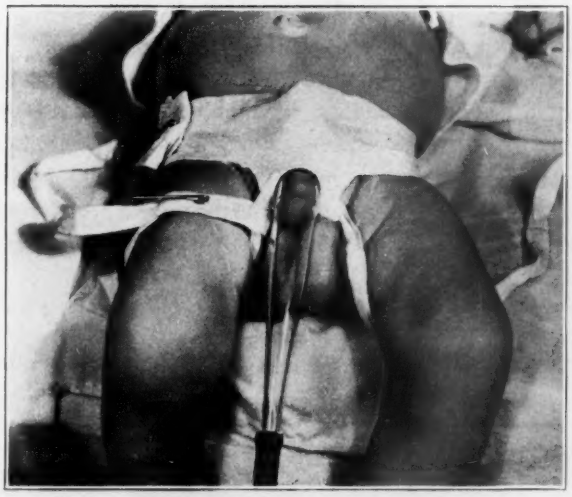

Fig. 5.—Attachment of urine collection tube. The abdominal binder is made of muslin 2 inches (5 cm.) wide. It bears a downward extension over the penis and upper scrotum with a hole either 19 or 23 mm. in diameter to hold the chosen tube. The thigh tapes are 15 inches (38 cm.) long. No adhesive tape is used.

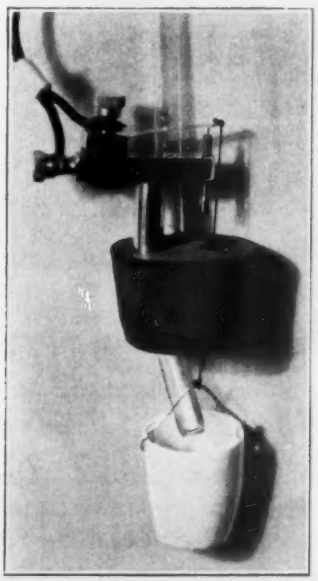

Fig. 6.—Urination announcer. A make and break contact is mounted on a no. 8 rubber stopper. The frame is made of metal with two electrically insulated contacts connected with a bell circuit. Contact is made through an adjustable vertical screw and a brass spring, each bearing platinum contact points. The spring is made of shim brass (no. 3, 0.005 inch thick) and is actuated by the weight of urine added quickly to the Gooch crucible (no. 2) supported from the spring tip.

inches [6.4 cm.] at the lower end). This binder is used to restrain the infant in the proper relation to the collection apparatus (fig. 3). The infant's legs are loosely held by wide towels pinned to the mattress cover.

The most essential factor in the accurate collection of urine is a carefully fitted tube or funnel over the penis. The specifications for the two sizes that we have found adequate are shown in figure 4. The

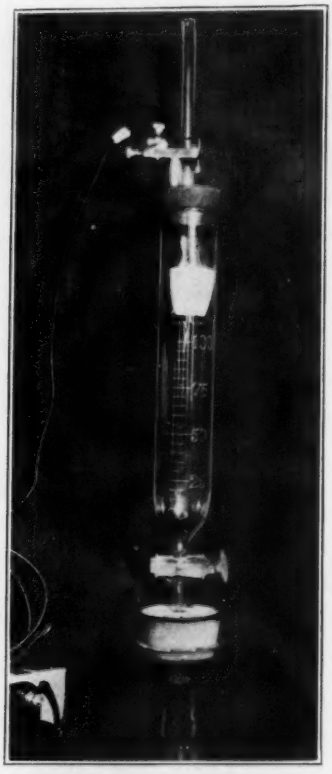

Fig. 7.—Announcer in position on graduated separatory funnel and large collection flask.

following particulars should be emphasized. The rim at the proximal end should flare sufficiently to prevent irritation of the skin and to prevent the tube from being pulled through the hole of the binder. The plane of the superior orifice should be at an angle of 35 degrees from the plane of the shaft of the tube. This sharp angle facilitates the proper downward slant of the funnel. Air must be admitted through the proximal end of the funnel to allow the urine to flow down the tubing. This requires loose fastening of the upper end of the tube

with an abdominal and thigh binder (fig. 5). Adhesive tape should never be employed.

New apparatus [3] has been gradually developed to permit the announcement of the act of voiding and to allow the measurement of each sample. The announcer (fig. 6) consists of a spring make and break unit connected with an electric bell or buzzer circuit and actuated by the weight of the voided urine temporarily held back in a Gooch crucible. The sensitivity can be adjusted so finely that small amounts of urine (from 3 to 4 cc.) will be effective in ringing the signal. This is accomplished by careful adjustment of the lower contact point and by closing the holes of the crucible with melted paraffin, clearing only a sufficient number to allow the slow passage of urine. The supporting thread for the Gooch crucible must pass through the exact center of the stopper, and the latter should be carefully adjusted to prevent friction between the crucible and the walls of the container. When voiding is completed, the crucible empties, releasing the electrical contact. Collection may be made into a graduated separatory funnel (fig. 7) which permits accurate reading of the volume before admission to the total sample or removal for separate analysis. The samples may, however, be collected directly in the general container.

The infant and apparatus require frequent attention from the nurses. The binders should be smoothed at regular intervals and their positions on the child changed slightly. He should be released from the chest binder and held in a nearly vertical position after each feeding. Frequent inspection and adjustment of the urine collection tube and drainage tubing are necessary to insure a distinctly downward slope. The funnel over the penis must be loosely attached to allow the ingress of air.

161 West Sixty-First Street.

3. The present form may be secured from Eimer and Amend, Eighteenth Street and Third Avenue, New York.

DYSCHONDROPLASIA FOETALIS

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Normal growth of the long bones proceeds from the ossification of cartilage cells in the epiphyses. At the zone of ossification the change from cartilage to bone takes place in an orderly manner; a columnar zone of calcification remains while new cartilage cells develop in the advancing zone. In this endochondral ossification the bone grows in length and at the same time "undergoes a remodeling process by which the new formed bone is pruned, reformed and incorporated as an intrinsic architectural part of the cylindrical shaft.[1]

This change from cartilage to bone may be interrupted by some inherent influence, and a partial or complete arrest of bone growth follows. Several well known clinical forms of defective development result from this interference, differing from each other to the extent that they have been described as separate clinical entities. These forms differ principally in the changes within the epiphyses, in the extent to which other bones formed in cartilage are involved and in their familial occurrence.

Probably the best known form of abnormal development of cartilage is chondrodystrophia foetalis (achondroplasia). This condition results when the arrest of endochondral ossification is complete and widespread, involving all the epiphyses of the long bones. In the majority of cases there results uniform enlargement of the ends of the bones, the arms and legs remain short because cartilage is not replaced by bone with normal activity and there is early cessation of growth. The bridge of the nose is retracted because the base of the skull, which is laid down in cartilage, does not attain its usual length.

Other disturbances of bone growth are found where the failure of differentiation is not complete or so widespread. Clusters of cartilage cells may be found at the end of the bone, situated subperiosteally or intramedullary, which have escaped ossification. Such cartilaginous masses may be found in the shaft at a considerable distance from the epiphyses where they have remained as longitudinal growth proceeded.

From the Department of Pediatrics, University of Kansas, and the Children's Mercy Hospital.

1. Keith, Arthur: Studies on the Anatomical Changes that Accompany Certain Growth Disorders of the Human Body, J. Anat. **54**:101 (Jan.-April) 1919-1920.

They may also grow from the end of the bone in the form of cartilage-capped exostoses. These cartilaginous masses occur more frequently in the ends of those bones in which growth is most rapid. They are usually bilateral and often symmetrical. The term, enchondroma, is commonly used to designate the form in which the lesion is situated within the bone. When there are also cartilaginous outgrowths, the term, multiple cartilaginous exostoses, is commonly used. Ehrenfried [2] grouped them under the title "Hereditary Deforming Chondrodysplasia." They are often associated with deformities of the shaft and shortening of the bone. This is probably the most common form of developmental defect of skeletal growth. Nearly a century ago Caesar Hawkins [3] described it under the name of "laminated exostoses."

The lesions consist of cartilaginous or osteocartilaginous growths within and on the skeleton that undergo ossification when skeletal maturity is attained. These masses are situated near the ends of the shaft in early life, but as growth proceeds, those which appear early come to lie at a distance from the zone of ossification. The epiphysis is rarely involved. The outgrowths may assume various forms, spinous, pedunculated or flat "table-top" masses. They frequently assume a "spur" formation which points away from the joint, because longitudinal growth of the bone carries the base of the tumor forward.

This cartilaginous dystrophy affects only those bones that develop in cartilage, and particularly those in which growth is rapid, the ulna, radius, femur, tibia and humerus. The scapulae, iliac crests and the ends of the clavicle are occasionally affected. The fingers and toes may show juxta-epiphyseal enlargement with variations in their length. When the lesions are situated within the bone, as in the metaphysis of the ulna, radius and humerus and in the proximal end of the tibia, the roentgenographic appearance is that of "bubble-like vacuolations suggesting cysts." The hereditary nature of the disease is well established.

Certain deformities of the skeleton have commonly been found associated with cartilaginous exostoses, viz., shortening of the ulna in relation to the radius and shortening of the fibula in relation to the tibia. The shortened ulna often results in bowing of the radius with deviation of the joint to the ulnar side and tilting of the plane of the joint, producing ulnar flexion at the wrists. The shortened fibula often results in a marked pes valgus.

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2. Ehrenfried, Albert H.: Hereditary Deforming Chondrodysplasia—Multiple Cartilaginous Exostoses: A Review of the American Literature and Report of Twelve Cases, J. A. M. A. **68**:502 (Feb. 17) 1917; Multiple Cartilaginous Exostoses—Hereditary Deforming Chondrodysplasia, ibid. **64**:1642 (May 15) 1915.

3. Hawkins, Caesar, quoted by Gwilyn G. Davis: Am. J. Orthop. Surg. **3**: 234 (Jan.) 1906.

Even frank cases of multiple cartilaginous exostoses show widely varying degrees of involvement. In a boy aged 9 years who came under my observation many exostoses were found on the hands and feet, but the exostoses were confined to these parts (fig. 11). The ends of the long bones in the upper and lower extremities showed deranged metaphyseal growth. A remarkable feature in this case is that a younger brother aged 20 months and the father each showed but a single exostosis: on a metacarpal bone in the father, and on a metatarsal in the child. The tumor in the father became much smaller after he attained skeletal maturity.

In 1899, Ollier [4] described a form of cartilaginous dystrophy in two children differing so greatly from the typical cases of multiple exostoses in certain features that he regarded it as a different clinical entity. His case showed cartilaginous masses near the epiphyses, predominant on one side, with pronounced disproportion in the length of the limbs and with curving and obliquity of the growth cartilages. The principal disturbance was within the bone, and although exostoses were present on the hands they were not a prominent feature. In Ollier's first case the condition was predominant on the right side; the right leg was 8 cm., and the right arm 6 cm., shorter than the left. Both hands, however, showed cartilaginous tumors. In the second case the right leg was 13.4 cm. shorter than the left, and exostoses were present. The left hand also showed involvement of the phalanges. Ollier and his pupil Molin, who elaborated on the pathology of this disease, considered one-sidedness characteristic of this condition and suspected a relationship between multiple enchondromas and cartilaginous exostoses.

Thus the anomalies of skeletal development are classified as follows: (1) chondrodystrophy, with a complete arrest of ossification and uniform enlargement of the ends of the bones owing to excessive growth of cartilage but without exostoses; (2) enchondromas occurring as multiple islands of cartilage cells within the epiphyses or shaft; (3) multiple cartilaginous exostoses (chondrodysplasia), in which outgrowths appear at the line of endochondral ossification between the epiphyses and diaphyses, and, finally, (4) dyschondroplasia, characterized by chondromas instead of exostoses and predominant on, if not limited to, one side or in one limb, with a disproportion in the length of the limbs.

Reports of cases of dyschondroplasia have appeared in the literature with many deviations from Ollier's original description. In the minds of recent observers, neither predominant one-sidedness nor the absence of exostoses is constant or characteristic, and Ollier's disease is more properly regarded as an uncommon form of multiple cartilagi-

4. Ollier, M., quoted by Jansen, footnote 16.

nous extoses or chondrodysplasia. Cole,[5] in 1926, described a case in a man which, because of its pronounced unilateral involvement, simulated the cases described by Ollier. He prefers the term chondrodysplasia and finds it difficult to make a classification of these cartilaginous dystrophies. One finds all degrees of gradation between frank multiple exostoses and so-called dyschondroplasia with nothing but a disturbance in the internal architecture of the bone. Cleveland[6] also regards Ollier's disease as a form of chondrodysplasia, and he reported the disease in a child 6 years of age. Gossage and Carling,[7] in 1910, stated that there was undoubtedly some relation between multiple exostoses and multiple enchondromas, and cited Weber and Lowen, both of whom observed exostoses associated with the characteristic changes of Ollier's dyschondroplasia.

Important contributions have been made to the pathology of dyschondroplasia in recent years. In 1924, Voorhoeve[8] reported three cases, in a father and two children, in which the principal disturbance was in the architecture of the bone. The outstanding feature was longitudinal striations running in a slightly radiate manner in the metaphyses of the long bones as well as in the pelvis, sacrum, os calcis, scapula and ribs. Wherever stria were found there was rarefaction of bone substance. These longitudinal stria had also been mentioned by Coon[9] and Bentzon.[10]

Voorhoeve's cases also showed clear translucent spots in the metaphyses of the femora. He also called attention to another symptom, small dense spots which had been described by Albert-Schonberg in dyschondroplasia. Several other observers had mentioned these dense spots, which were round, oval or lancet-shaped and about the size of a pea, and occurred only in patients after puberty. Cole,[5] in America, observed them in a girl aged 11 years. Thus several additional symptoms have been added to the classic description of Ollier.

This report is prompted by a study of three children from one family with many of the features of Ollier's dyschondroplasia, but with

5. Cole, Wallace H.: Chondrodysplasia, Surg., Gynec. & Obst. **42**:259 (March) 1926.

6. Cleveland, Mather: Chondrodysplasia, Surg., Gynec. & Obst. **47**:338 (Sept.) 1928.

7. Gossage, A. M., and Carling, E. Rock: Proc. Roy. Soc. Med. (Sect. Med.) **4**:1, 1910.

8. Voorhoeve, N.: L'image radiologique non encore de crête d'une anomalie du squelette, Acta radiol. **3**:407, 1924-1925.

9. Coon, Clarence E.: Dyschondroplasia, Am. J. Orthop. Surg. **9**:604 (May) 1912.

10. Bentzon, P. K. G.: Roentgenological and Experimental Studies on the Pathogenesis of Dyschondroplasia, Acta radiol. **3**:89, 1924.

marked involvement of the epiphyseal cartilage. They had some of the characteristics of chondrodystrophia foetalis. The involvement of the epiphyses was not unlike that found in the localized lesion of osteochrondritis deformans juvenilis. The thinning and irregularities of the growth disk, the absence of exostoses and the deformities of the radius and ulna conformed to the features of those cases reported as dyschondroplasia.

The ages of the children were 10, 11 and 15 years, respectively. One other child and the mother were similarly affected, but did not come in for study. The father and six other children were apparently normal,

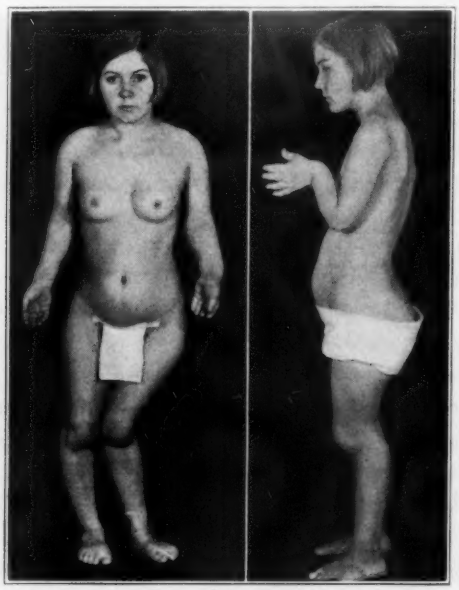

Fig. 1 (case 1).—J. W., aged 15 years. Note the disproportion in the length of the limbs and trunk, the shortened ulna and the curved radius in left arm. The acute median angulation in the knee is due to defective calcification in the proximal end of the tibia.

although only one of these children and the father were examined roentgenologically. In each of the affected children the disease came on insidiously and was noticed when they were about 5 years of age.

REPORT OF CASES

CASE 1.—J. W., a girl (fig. 1), aged 15 years, weighed 43 Kg. and measured 1.34 meters in height. She was 9 cm. shorter than her unaffected sister, aged 13 years. She had a disproportion in the length of trunk and limbs, a marked lordosis, genu varum on the left and valgum on the right and a high degree of pes valgus. There was a thickening about the shoulder joint, with shortening and angulation

of the left forearm and lateral flexion of the hand. The left ulna was shortened and the radius bowed. There was a disproportion in the length of the forearms and, to a lesser extent, of the lower extremities (table 1).

Four determinations of the calcium and phosphorus over a period of six months showed calcium between 9.9 and 11.7 mg., and phosphorus between 5.0 and 6.5 mg. per hundred cubic centimeters.

Roentgen examination of the skull showed a slight increase in the superior-inferior diameter; the cranial table was normal. There was some calcification of the clinoidal ligaments of the posterior clinoid process. The lumbar vertebrae presented a slight right scoliosis, and the vertebral edges, slight lipping. The right knee presented an extensive deformity in that the proximal end of the tibia showed rarefaction and irregular calcification. It appeared to be resorbed. An acute median angulation at the left knee was noted. The interarticular space was diminished, and both the femoral and tibial condyles were misshapen.

The feet showed shortening of the metatarsal bones; the right hand, shortening of the metacarpals. The right radius was considerably longer than the ulna and

TABLE 1.—*Measurements of the Trunk and Extremities*

	J. W.		G. W.		A. W.	
Trunk						
Age	15 years		11 years		10 years	
Weight	43 Kg.		31 Kg.		31 Kg.	
Height	134 cm.		131 cm.		122 cm.	
Sitting height	92 cm.		82 cm.		76 cm.	
Extremities						
Upper extremity	Right, Cm.	Left, Cm.	Right, Cm.	Left, Cm.	Right, Cm.	Left, Cm.
Acromion to internal condyle radius	23	23	25	25	21	22
Acromion to external condyle radius	23	23	24.5	24.5	21	22
Acromion to styloid ulna	38	34.5	36	36	31	34
Acromion to styloid radius	39	36	36	36	32	34
Lower extremity						
Anterosuperior spine to internal condyle	35	36	39	39	35	35
Anterosuperior spine to external condyle	34	35	35	38	34	34
Anterosuperior spine to internal malleolus	67	65	69	69	66	66
Anterosuperior spine to external malleolus	66	64	69	69	65	65

curved to the ulnar side. The pelvis showed definite asymmetry with no inpushing of either acetabulum. Both femoral heads showed marked rarefaction (fig. 4). General asymmetry resulting from rotation of the pelvis was also noted (fig. 1).

CASE 2.—G. W., a boy (fig. 2), aged 11 years, weighed 31 Kg. and measured 1.31 meters in height. Bony enlargements were present at the distal ends of the radii and tibiae. He had a marked lordosis, genu varum and eversion of both feet. There was no apparent disproportion between the length of the trunk and that of the extremities, and no curving or distortion of the limbs. The calcium content of the blood ranged between 9.9 and 11.5, and the phosphorus between 5.0 and 7.0 Gm. per hundred cubic centimeters.

Roentgen examination showed the skull to be normal; the vertebrae presented no error in alinement; the vertebral disks were broad, and the vertebral edges rounded. The distal ends of the tibiae and fibulae presented essentially the same changes as those described in the sister of the patient. Both feet showed a reduction in the size of the scaphoid approaching the deformity described as Koehler's disease. The distal ends of the metatarsals showed changes characteristic of rickets. Both femoral heads showed the extensive rarefaction found in the sister, and the acetabula were pushed to the midline (figs. 6, 7 and 8).

CASE 3.—A. W., a girl (fig. 3), aged 10 years, weighed 31 Kg. and measured 1.22 meters in height. There was a disproportion in the length of trunk and limbs, the extremities being short. The right arm was curved and shortened, and an angular deformity at the carpus caused eversion and marked lateral flexion of the hand. The distal ends of both femora and radii were enlarged. The patient was short of stature, and had marked lordosis and pes valgus. There was a disproportion in the length of the extremities (table 1).

Roentgen examination of the lumbar and lower dorsal vertebrae showed wide intervertebral disks with rounding of the bodies of the vertebrae and some general diminution in calcification. The appearance of the vertebrae was not that of osteoporosity, but rather a coarseness of the bony trabeculae. The left tibia and fibula presented a slight external bowing and irregular calcification at the epi-

Figure 2

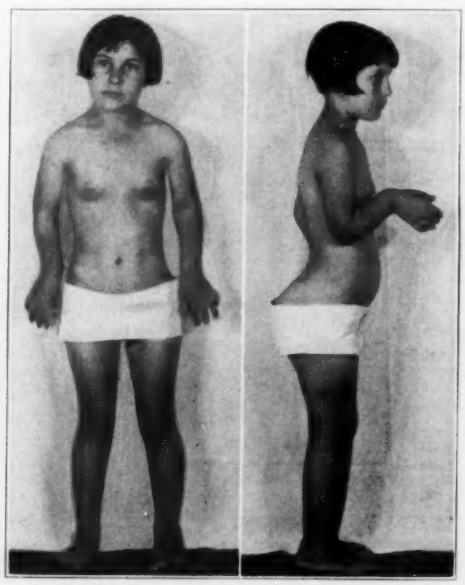

Figure 3

Fig. 2 (case 2).—Appearance of G. W.

Fig. 3 (case 3).—A. W., aged 10 years. Shortening of the ulna and bowing of the radius in the right arm. There is also disproportion in the length of the limbs and trunk, marked lordosis and pes valgus.

physeal line, particularly in the tibia. The articular surfaces of the astragulus and tibia were somewhat irregular, and there was a moderate flaring of the tibial diaphysis.

The right radius was curved laterally, and the ulna was much shorter than the radius. The epiphyseal line and lateral border of the radius were irregular in both outline and density. The left wrist showed less deformity. The epiphyses of the phalanges were widened. Both feet showed a diminution in the size of the scaphoid and flaring of the metatarsals. The distal end of the first metatarsal was irregular and the interarticular space increased. The appearance of the scaphoid resembled the changes seen in Koehler's disease. There was also marked rarefac-

tion in the femoral epiphyses, with irregular calcification in the acetabula, as noted in the two preceding cases (fig. 9).

The photographs of these children show the disproportion in the length of trunk and limbs in the two girls, as well as the deformity of the forearms. The roentgenograms show the unusual involvement of the epiphyses. These were prematurely fused and showed areas of irregular calcification and rarefaction. The cessation of growth was irregular, producing the knock-knee deformity of J. W.

The three cases were characterized by an arrest in ossification with small epiphyseal plates or cartilaginous coverings most marked in the

Fig. 4 (case 1).—Reformation of the epiphyseal heads in the deformed position and flattening of the acetabula are seen. There is shortening of the neck without the increase in breadth characteristic of osteochondritis deformans juvenilis.

carpal and tarsal bones of G. W. There were no exostoses. J. W. presented the trident hand commonly found in chondrodystrophia foetalis, but none of the patients showed the saddle-nose deformity, disproportionately large head or dwarfing characteristic of this condition.

In chondrodystrophia foetalis the principal involvement is found in the cartilage at the zone of ossification. This produces an overgrowth and expansion of the end of the bone and retards longitudinal growth; the epiphysis is relatively smaller than the metaphysis and is "held as in a cup by the latter." The epiphyses are usually about normal in size, but in some cases may be swollen and misshapen. They are abnor-

mally vascular and soft, and ossification is much retarded. However, the irregular calcification or rarefaction found in the three cases described is not found in chondrodystrophy.

In these cases the great rarefaction of the epiphyses was the outstanding feature. This epiphyseal involvement was widespread and most marked in the bones where longitudinal growth is greatest. Many of the epiphyses were prematurely fused, and cessation of growth was irregular.

The deformity of the forearm produced by the shortening of the ulna and the bowing of the radius is a classic deformity. Keith,[1] in his description of chondrodysplasia which he termed "diaphyseal aclasis," said that "the radius becomes the bent bow and the ulna serves as its taut string. In about one third of the cases the bow becomes unbent by a spontaneous dislocation of the proximal end of the radius." The involvement of the crest of the ilium seen in these cases is also a char-

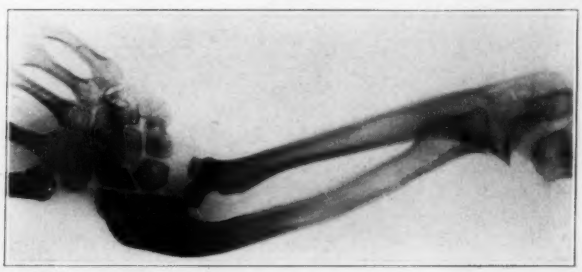

Fig. 5 (case 1).—Deformity of the left forearm resulting from the shortened ulna and bowed radius. This condition is frequently found in those cases described as chondrodysplasia and Ollier's dyschondroplasia.

acteristic of dyschondroplasia (fig. 13). The metaphyses were not involved as in the typical case of dyschondroplasia, except that there was a suggestion of longitudinal striations, but there were no large areas such as have been described.

In typical cases of dyschondroplasia, the phalanges, especially of the hands, are a common site for subperiosteal growths as well as exostoses (fig. 11). In these three cases there were no such lesions but rather a shortened metacarpal with widened epiphyses and irregular calcification. The wide epiphyses in the metacarpals and the metatarsals were suggestive of chondrodystrophy. The trident hand of one (J. W.) and the disproportion in the length of the limbs and the trunk were also suggestive of this condition. But in no cases of chondrodystrophy are there such changes in the epiphyseal cartilages as were present in these children.

The changes in the heads of the femora and acetabula resembled those of osteomalacia. There appeared to be an extensive destruction, so that

the head of the femur had almost disappeared in some plates. There had been no pain or febrile disturbance associated with this condition. The history obtained from the parents was that the deformities were noticed to be developing at about the age of 5 years. At the time of this report the disease was making its appearance in a brother, aged 2 years.

The condition presented by these children impressed one as an unusual form of dyschondroplasia. Other cases in the literature have

Fig. 6 (case 2).—The epiphyseal heads of the femur show extensive coarseness of the cancellous bone and loss of contour of the articular head, with thickening of the bone at the acetabula. Note the deformity of the epiphyseal lines in the acetabula. There is involvement of the epiphyses of each trochanter, and there appears to be some thickening of the left femoral neck. The crest of the ilium is wavy in outline.

not shown this pronounced rarefaction in the epiphyses. Because of the presence of other deformities that are commonly found in dyschondroplasia, these epiphyseal rarefactions are interpreted as areas of incomplete ossification. Because of the familial occurrence and the widespread involvement, it is not likely that there has been a loss of calcium salts

from preformed bone. The condition is typical of cartilaginous dystrophy, with the exception, as has been mentioned, of the involvement of the epiphyses. These children did not present great disproportion in the length of the limbs, there was no marked shortening, and aside from the deformity of the radius and ulna there were no particular curves or torsion of the bones and no exostoses. In these features they differed

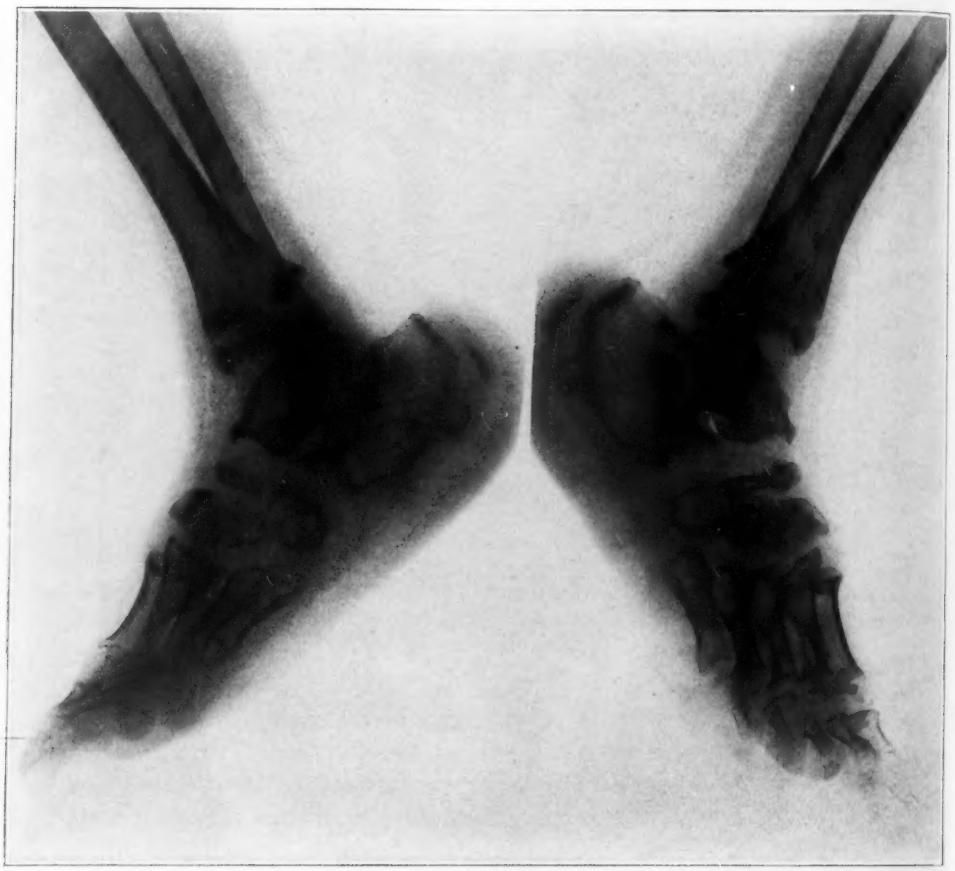

Fig. 7 (case 2).—The articular ends of the phalanges and first metatarsal show vacuolations and irregularity, with increased coarseness of the cancellous portion. The proximal ends of the metatarsals show bizarre development secondary to an abnormal articular relationship. The scaphoid is flattened longitudinally; this condition if present alone would be referred to as Koehler's disease.

from the majority of cases reported as dyschondroplasia or as chondrodysplasia.

The nearest approach to the epiphyseal disturbance present in these three children that I have found is in the case described by Nils

Silfverskiold [11] as a "form fruste" of chondrodystrophy, with changes simulating those of several of the well known local malacias. In his patient the upper arms were short, the head remarkably large and the cartilaginous part of the nose depressed. His roentgenograms show areas of rarefaction in the hip joint and femoral neck and incomplete calcification of the epiphyses of the femur. The changes in the femoral epiphyses were much more extensive than those found in Legg-Calvé-Perthes' disease. There was thickening of the first metatarsal with a fragmented epiphysis and high grade flattening of the osseous nucleus in the scaphoid suggestive of Koehler's disease.

Fig. 8 (case 2).—Roentgenogram taken ten months later than figure 7. The shadows are more dense, indicating calcification.

Morquio and, later, Ruggles [12] reported a peculiar form of dwarfism with pronounced disturbance in the epiphyses, the heads of the femora being absent in most cases and the acetabula eroded upward. This condition, of which there are only these two reports in the literature, is

11. Silfverskiold, N.: A "Forme Fruste" of Chondrodystrophia with Changes Simulating Several of the Known "Local Malacias," Acta radiol. **4**:44, 1925; Sur la question de l'achondroplasia atypique et de sa forme périphérique, ibid. **5**:223, 1926.

12. Ruggles, Howard E.: Dwarfism Due to Disordered Epiphyseal Development, Am. J. Roentgenol. **25**:91 (Jan.) 1931.

familial; Morquio had four cases in a family of five, and Ruggles, seven cases in a family of eight children. Ruggles stated that all the affected children looked like members of the same family, as he compared photographs of Morquio's cases with his. They do not often exceed 1 meter in height, there is apt to be kyphoses in the thoracic or lumbar region and the hands reach almost to the knees. In the roentgen appearance of the acetabula and femoral heads, the cases resemble mine, but the extreme dwarfism and loss of muscular power place them in a different category.

Fig. 9 (case 3).—Bilateral coxa vara, irregular epiphyses and vacuolization of the acetabula. The epiphysis of the greater trochanter on the right shows changes, while that on the left is normal.

Brailsford [13] described an unusual form of dwarfism in a boy 3 years and 9 months of age, with changes in the epiphyses similar to those in the cases herein reported. This boy was only 31 inches (78.7 cm.) in height and weighed 26 pounds and 11 ounces (12 Kg.). The characteristic roentgen appearances were large joint spaces, the irregularity and fragmentation of the epiphyses, particularly of the metatarsals and metacarpals, the irregular shape and size of the vertebral

13. Brailsford, James F.: Chondrodystrophy, Am. J. Surg. **7**:404 (Sept.) 1929.

bodies and the dislocation of the lumbodorsal vertebrae. This case had none of the characteristics of dyschondroplasia, but in its epiphyseal involvement it resembled the changes seen in my patients.

Dale [14] described three cases of a very unusual systemic disease of the skeleton which he called chrondro-osteodystrophy. The most important skeletal changes were defective ossification of the bodies of

TABLE 2.—*Sample Day's Diet: Low Calcium and Phosphorus (1,418 Calories)*

	Breakfast, Gm.	Dinner, Gm.	Supper, Gm.	Carbohydrate, Gm.	Protein, Gm.	Fat, Gm.	Calcium, Gm.	Phosphorus, Gm.
Bacon	20	..	..	.....	4.6	13.4	0.006	0.0192
Bread (milk-free)	30	30	30	47.88	7.0	1.89	0.0099	0.0738
Nut margarine	10	10	10	.....	...	30.0	.....	.....
Apple (cooked)	100	..	100	27.0	0.6	1.0	0.02	0.024
Sugar	20	10	20	.....	...	...	.....	.....
Steak lean	..	40	..	.....	8.5	3.2	0.0032	0.0688
Potato (steamed)	..	75	..	13.56	1.43	0.08	0.0083	0.0356
Corn (canned)	..	75	..	14.75	2.1	0.9	0.0037	0.0323
Banana	..	100	..	21.0	1.1	0.6	0.007	0.043
Chicken	..	..	30	.....	6.45	0.75	0.006	0.0474
Rice	..	..	75	60.0	6.0	0.22	0.0045	0.0562
Tomato	..	..	100	4.0	1.2	0.2	0.007	0.055
Total				188.19	38.98	52.24	0.0756	0.4553

TABLE 3.—*Intake and Output of Calcium and Phosphorus: Jessie W.*

	Urine		Feces	
Day	Calcium, Gm.	Phosphorus, Gm.	Calcium, Gm.	Phosphorus, Gm.
1	0.1275	0.192	.....	.....
2	0.0223	0.183	.....	.....
3	0.0130	0.170	0.069	0.142
4	0.0675	0.183	.....	.....
5	0.0185	0.172	.....	.....
6	0.0147	0.168	0.125	0.248
7	0.0905	0.175	.....	.....
8	0.0767	0.168	.....	.....
9	0.0311	0.108	0.070	0.104
10	0.0288	0.119	.....	.....
11	0.0263	0.128	.....	.....
12	0.1201	0.227	0.153	0.338
	0.637	1.993	0.417	0.832

Total calcium excreted	1.054 Gm.	Total phosphorus excreted	2.825 Gm.
Total calcium consumed	0.914 Gm.	Total phosphorus consumed	5.645 Gm.
Balance	−0.140 Gm.	Balance	+2.820 Gm.

the vertebrae with kyphosis and scoliosis; defective development of the heads of the femora, and widened acetabula with minor changes in the shoulder and knee joints resembling those of local malacias. The extremities were of normal length, while the trunk was abnormally short. The author suggested that the disease was due to a disturbance of the endocrines and represented a condition intermediate between chondrodystrophia foetalis and the local malacias.

14. Dale, T.: Unusual Forms of Familial Osteochondrodystrophy, Acta radiol. **12**:337, 1931.

CALCIUM AND PHOSPHORUS METABOLISM

Studies of the calcium and phosphorus metabolism were made in these patients. On the regular diets all showed normal retention. The determinations were then made with a low calcium diet as suggested by Bauer, Albright and Aub.[15] These authors have suggested a low

TABLE 4.—*Intake and Output of Calcium and Phosphorus: Ada W.*

	Urine		Feces	
Day	Calcium, Gm.	Phosphorus, Gm.	Calcium, Gm.	Phosphorus, Gm.
1	0.085	0.119	.....	.....
2	0.035	0.120	.....	.....
3	0.035	0.111	0.236	0.528
4	0.040	0.208	.....	.....
5	0.009	0.167	.....	.....
6	0.009	0.209	0.066	0.389
7	0.047	0.162	.....	.....
8	0.046	0.163	.....	.....
9	0.014	0.118	0.092	0.194
10	0.009	0.181	.....	.....
11	0.008	0.121	.....	.....
12	0.038	0.314	0.057	0.196
	0.375	1.993	0.451	1.307

Total calcium excreted	0.826 Gm.	Total phosphorus excreted	3.300 Gm.
Total calcium consumed	0.913 Gm.	Total phosphorus consumed	5.645 Gm.
Balance	+0.087 Gm.	Balance	+2.345 Gm.

TABLE 5.—*Intake and Output of Calcium and Phosphorus: George W.*

	Urine		Feces	
Day	Calcium, Gm.	Phosphorus, Gm.	Calcium, Gm.	Phosphorus, Gm.
1	0.1048	0.272	.....	.....
2	0.0600	0.205	.....	.....
3	0.0423	0.122	0.135	0.134
4	0.0121	0.191	.....	.....
5	0.0121	0.157	.....	.....
6	0.0053	0.097	0.123	0.229
7	0.0385	0.178	.....	.....
8	0.1334	0.181	.....	.....
9	0.0574	0.155	0.098	0.143
10	0.0511	0.164	.....	.....
11	0.0699	0.133	.....	.....
12	0.0050	0.149	0.231	0.394
	0.5928	2.004	0.587	0.900

Total calcium excreted	1.1798 Gm.	Total phosphorus excreted	2.904 Gm.
Total calcium consumed	0.9137 Gm.	Total phosphorus consumed	5.6448 Gm.
Balance	−0.266 Gm.	Balance	+2.740 Gm.

calcium intake for metabolism work because, "inasmuch as calcium is excreted into the bowel as well as into the urine, any figure obtained for fecal calcium would consist of two components: the calcium which had passed through the intestines unabsorbed and the calcium which had

15. Bauer, W.; Albright, F., and Aub, J. C.: Studies of Calcium and Phosphorus Metabolism: II. The Calcium Excretions of Normal Individuals on a Low Calcium Diet, Also Data on a Case of Pregnancy, J. Clin. Investigation **7:75** (April) 1929.

been absorbed and reexcreted. The latter of these alone can be thought of as actively taking part in calcium metabolism."

The patients were given a neutral diet with a low calcium and low vitamin content. Bauer and Aub found in thirteen normal persons in whom forty-six three-day metabolism studies were made that the average calcium intake per three-day period was 0.33 Gm., and the output 0.19 Gm. in the urine and 0.60 Gm. in the feces. This gave a negative calcium balance of 0.46 Gm. in normal persons on this restricted diet.

A diet with a low calcium content was adopted without regard to the acid-base ratio, and no determinations were made to see whether the patients remained in nitrogen equilibrium. The patients were kept in bed on the special diet for four days before the excreta were collected. The stools were marked by the administration of carmine and were collected in three-day lots. The urine was analyzed daily.

Fig. 10 (case 3).—Shortened ulna and bowing of the radius of the right forearm almost identical with deformity of the left in J. W. (case 1).

The studies were made for twelve days. The figures show that the children maintained nearly a calcium balance. A. W. (table 4) showed a retention of only 0.087 Gm.; J. W. (table 3) showed a loss of 0.14 Gm., and G. W. (table 5) a loss of 0.266 Gm. The single control showed a loss of 0.31 Gm.

The calcium loss in these patients is not as much as Bauer and Aub found in normal persons. The figures were interpreted to mean that there was no disturbance of calcium and phosphorus metabolism.

The mechanism by which the cartilaginous masses develop has never been clearly understood. According to Keith the diaphyseal line is composed of two parts, the cartilaginous part in which endochondral bone is laid down, and surrounding this the periosteal ring or ferrule where growth in length also takes place. This periosteal ring growth represents the margin at which the covering of periosteal bone extends itself over the growing core of cartilage-formed bone. In normal development the

cartilaginous core and the periosteal ferrule proceed at an equal pace. In chondrodystrophia foetalis the arrest of growth occurs in the cartilaginous core; the periosteal ferrule outstrips and overlaps the cartilage formed bone. In diaphyseal aclasis (chondrodysplasia) the opposite is the case: the periosteal extension is arrested and areas of cartilage-formed bone are exposed on the surface of the shaft. The periosteum and the osteoblasts from the periosteum are the main agent in the modeling of bone. Hence with the arrest of the periosteal growth ring the process of modeling becomes retarded and irregular; the diaphyseal cartilage, thus exposed on the surface, is free to expand in abnormal

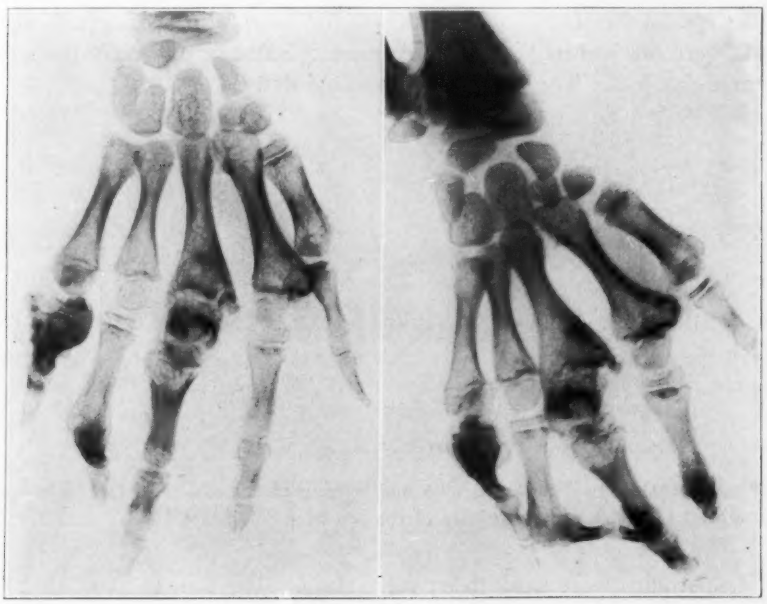

Fig. 11.—Glenn A., aged 8 years. The cartilaginous exostoses (chondrodysplasia) are confined to the hands. The long bones show defective cartilage growth in the metaphyses. The epiphyses are not involved. This is the typical picture of chondrodysplasia.

directions. Keith believes that an endocrine disturbance is responsible for these changes.

Bentzon believes that a deficiency in the blood supply to the metaphysis, rather than a dystrophy of growing cartilage, is responsible for the changes. One of his cases showed an anomaly of the second dorsal vertebra, its right side being lower than the left. He also observed hemiatrophy of the face on the same side as the affected bones in dyschondroplasia. Other observers had noted vascular disturbances, cavernous angiomas, associated with these bone changes. This prompted Bentzon to experiment with growing rabbits by producing lesions in the

sympathetic cords with injections of alcohol. He was able to produce changes in the phalanges simulating those of Ollier's disease. He also injected alcohol to injure the nutrient artery of the tibia, and showed longitudinal clear bands and periosteal deposits fourteen days later in the roentgenograms. He concluded that Ollier's disease is a reaction of the bones against an active hyperemia of the bone tissue from anomalies of the vegetative nervous system, thereby differing with Ollier who regarded the disease as a disturbance of epiphyseal growth.

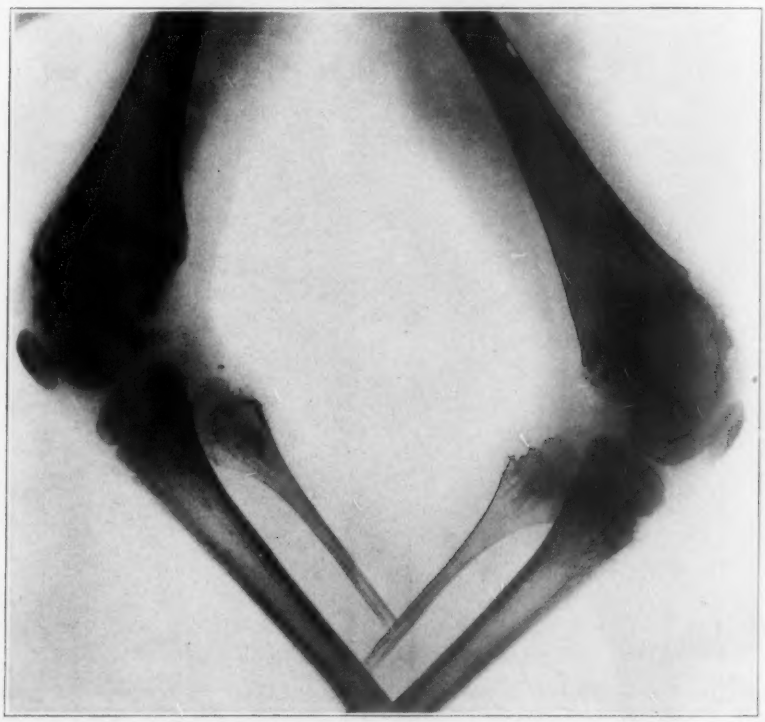

Fig. 12.—Glenn A. Deranged cartilage growth in the metaphyses of femora tibiae and fibulae, in a case of chondrodysplasia. Note the normal epiphyses.

Murk Jansen,[16] in a most exhaustive essay on the subject, explained these disturbances in growth on a failure of one or more of several processes that cooperate in the development of bone. He assumed that "six different processes, and probably more, have to cooperate harmoniously in order that the bones shall attain their proper size, shape, structure and composition" to complete their growth. Sometimes one or more

16. Jansen, Murk: Dissociation of Bone Growth in the Robert Jones Birthday Volume, New York, Oxford University Press, 1928.

of these processes is delayed with regard to the others for a period, or it dissociates itself from the other processes. The dissociation of each of these processes evokes its own characteristic symptoms. During growth the epiphysis is displaced distally by the growth disk; the metaphysis is not. Therefore the metaphysis must undergo some change; it must be transformed into the compact tissue of the shaft. In order for it to assume this shape and density, there is a resorption of cancellous tissue,

Fig. 13.—Glenn A. Note the involvement of the iliac crests and femoral metaphyses with normal epiphyses.

and it is transformed into the compact diaphyseal tube. This process Jansen called tubulation. Complete retardation of tubulation results in widened metaphyses; partial retardation, in exostoses. This dissociation by retardation of tubulation is one of the most common of the defects in growth.

Changes in the growth disk, causing it to become irregular in shape or oblique, are brought about by retardation of cell division, according to Jansen. "The enlarged cartilage cells in normal bone growth are

transformed into bone until none are left. If this takes place over the whole area of the growth disk and in all its parts at the same rate, a mere shortening of the bone will result. If, however, the retardation of cell division is unequal in different parts of the disk, irregularities in the form and position of the disk must ensue." This irregular shape in the growth disk results in some of the prominent symptoms of dyschondroplasia, viz., varus, valgus flexion and hyperextension positions as well as shortening of the long bones.

The cartilaginous masses within the bone are the result of dissociation through retardation of differentiation. These clear areas in the

Fig. 14.—William P., aged 9 years. A typical picture of multiple cartilaginous exostoses (chondrodysplasia). There is extensive derangement of the cartilage growth in the metaphyses, extending down into the shaft of the humerus, with exostoses on the humerus and scapula. The adjacent epiphysis is not involved.

roentgenogram are groups of cartilage cells that have escaped differentiation into bone. Jansen regards this dissociation process as the most important one clinically, because of the possibility of these tumors becoming malignant. Enchondromas result when no differentiation has set in. On the other hand, if differentiation has set in and has been checked in its growth, giant cell tumors will develop. It is not a rare clinical observation to find the malignancy occurring in what was regarded as a benign cartilaginous growth.

These phenomena of dissociation of bone growth, three of which are mentioned—retardation of tubulation, retardation of cell division and retardation of differentiation—account for the principal bony changes in dyschondroplasia. Jansen also stated that dissociation of bone growth occurs "not only in the relatively rare cases of dyschondroplasia, but with far greater frequency in the conditions of general dwarfism known as cretinism, rachitis and the not too severe forms of achondroplasia. In these conditions the dissociation is restricted to differentiation—and not limited to one or a few growth disks, but extends over all the growth disks. There is a systemic dissociation in these conditions in contrast with the local dissociation phenomena of dyschondroplasia."

SUMMARY

Three children of one family, a boy, aged 11 years, and two girls, aged 10 and 15 years, respectively, presented an unusual condition of the epiphyseal cartilages, associated with certain characteristic deformities of Ollier's dyschondroplasia.

The lesions consisted of incomplete calcification of the epiphyses, most marked in the heads of the femora and the acetabula. The ends of the other long bones were similarly involved. The principal deformities were caused by a shortening of the ulna and bowing of the radius in one arm of each of the girls, pes valgus of extreme degree from shortening of the fibula and angulation at the knee joint from small irregular epiphyseal plates at the distal end of the femora.

The cases showed no exostoses and very slight involvement of the metaphyses, thereby differing from the usual picture of chondrodysplasia (multiple exostoses) or dyschondroplasia (Ollier's disease). They are compared with typical cases of multiple exostoses and chondrodystrophia foetalis.

The widened metacarpal epiphyses, the short stature and the trident hand of one girl resembled chondrodystrophia foetalis. However, the deformity of the forearm in two of these children and rarefaction of the iliac crest are classic deformities of the condition described as dyschondroplasia, and the condition presented in these children is regarded as an unusual form of this disease, unusual because of rarefaction of the epiphyses.

Studies of the calcium and phosphorus metabolism in these children while on a low calcium diet showed slight negative balances comparable to those found in normal persons. The condition is interpreted as an incomplete calcification of the epiphyses of growing bone rather than as a loss of mineral substances from the bone.

The term hereditary deforming chondrodysplasia is in common use in American literature and covers all the defects of cartilaginous dys-

trophy resulting from a partial arrest of endochondral ossification. The most common clinical manifestation is the development of multiple cartilaginous exostoses.[17] Dyschondroplasia or Ollier's disease may be regarded as a form of chondrodysplasia which is predominantly unilateral and characterized by cartilaginous masses situated within the bone rather than exostoses.

The term dyschondroplasia foetalis in the title of this paper is used as descriptive of abnormal cartilage growth dating back to the fetal period.

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17. A more complete bibliography on multiple exostoses can be found in the article by Kelley Hale (Ann. Surg. **92**:92 [July] 1930).

Case Reports

TUBERCULOSIS OF THE MYOCARDIUM

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Tuberculosis of the heart is uncommon. This is not at all strange when one realizes how rarely tuberculosis attacks muscle tissue in general. Tuberculosis of the pericardium is by far a more frequent finding than tuberculosis of the myocardium. Sir William Osler,[1] for instance, reported the finding of 275 tuberculous subjects in 1,000 autopsies, of which 7 had tuberculosis of the pericardium. Wells [2] found 10 cases of tuberculous pericarditis in 1,048 autopsies. Brooks and Lippincott,[3] among 1,000 autopsies, found 23 cases of tuberculous pericarditis. Tuberculosis of the myocardium, however, is a much rarer finding. Nevertheless, a fairly large number of cases of tuberculosis of the myocardium has been reported. This is because many of the cases are secondary to a tuberculous pericarditis. True cases of primary tuberculous myocarditis are quite rare. Virchow once declared that tuberculosis cannot appear in the muscle of the heart. Despite that statement, cases of tuberculosis of the heart are being reported constantly. Up to 1906, Raviart [4] was able to collect 185 cases, in only about 70 per cent of which was tuberculosis definitely established. Since 1906, about 40 additional cases have been reported. On close scrutiny of these cases, it is found that many of them were primarily tuberculous pericarditis and that the myocardium was involved secondarily by contiguity, by infection of the lymph or the blood stream. Another group of cases that has been included as

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From the Department of Pediatrics and the Pathological Laboratories of the Jefferson Medical College and Hospital.

1. Osler, William: Tuberculous Pericarditis, Am. J. M. Sc. **105**:20 (Jan.) 1893.
2. Wells, H. G.: The Pathology of Active Tuberculosis of the Pericardium, J. A. M. A. **36**:1451 (May 25) 1901.
3. Brooks, H., and Lippincott, L.: An Anatomical Study of Pericarditis, Am. J. M. Sc. **138**:796 (Dec.) 1909.
4. Raviart, G.: La tuberculose du myocarde, Arch. de méd. expér. et d'anat. path. **18**:141, 1906.

tuberculosis of the myocardium and reported by French authors as "interstitial tuberculous myocarditis," does not stand very well the application of the diagnostic criteria for tuberculosis. Gallavardin and Gravier,[5] for instance, reported 2 cases of "interstitial tuberculous myocarditis," in spite of the fact that in the authors' own words they found "no nodular formation, no giant cells, no caseation, and no tubercle bacilli in the heart." They did not perform any inoculations on animals, and they simply considered the cases as "interstitial tuberculous myocarditis," because the subjects were too young for ordinary myocardial degeneration and because they found tuberculous lesions elsewhere (mediastinal glands, pleura, lungs and peritoneum). Altogether about 5 cases have been reported under that heading. Analogously, even Massini's [6] case cannot properly be classed as tuberculous myocarditis. He found tubercle bacilli in the myocardium of a woman who died of chronic myocarditis but who never showed any signs of tuberculosis during life or at autopsy. This case certainly cannot be classed as tuberculous myocarditis, for the bacilli found may have been other acid-fast organisms. It is clear, therefore, that even though more than 200 cases of tuberculosis of the myocardium have been reported, a good number of them either are cases in which the myocardium was involved secondarily to disease of the pericardium, or are cases that really do not stand the criteria for tuberculosis. The case that we shall present is one in which the pericardium was without evidence of tuberculous infection. The myocardium was primarily attacked in the course of a generalized tuberculous infection.

The age is given in 124 of the 185 cases reported by Raviart [4]; 51 of the patients, or 40 per cent, were below 15 years. The cases that Raviart reviewed show that any portion of the heart can be affected, but that the left ventricle is most often involved, then in order the right auricle, the right ventricle and finally the left auricle. In our case, also, it was the left ventricle that was the seat of the tuberculous lesion. Raviart said that "strangely enough miliary tubercles have been less frequently found than gross nodules," which is the form in which tuberculosis of the myocardium occurs most frequently. In the light of our present knowledge, we do not find this to be at all strange, for miliary tuberculosis is now considered as the reaction of a more or less resistant host to the tubercle bacillus, in that the tubercle bacilli are phagocytosed and walled off wherever they lodge. In cases in which the muscle of the heart is attacked by the tubercle bacillus, the resis-

5. Gallavardin, L., and Gravier, L.: Myocardite interstitielle subaigue d'origine tuberculeuse, Arch. d. mal. du cœur **21**:472 (July) 1928; Médecine **7**:431, 1926.

6. Massini, R.: Ueber tuberculose Myokarditis, Schweiz. med. Wchnschr. **51**: 223, 1921.

tance of the host must be very low, and therefore instead of phagocytosis, encapsulation and tubercle formation, there is more commonly large nodule formation or diffuse tuberculous infiltration.

Tuberculosis of the myocardium may be divided into three types: first, the nodular form, to which our case belongs; second, miliary tuberculosis, which is less common, and third, the diffuse form of tuberculous infiltration, which is the least common and of which only about 12 cases have been reported. Strangely enough, the large nodules that occur in the first form do not undergo the process of ulceration or cavity formation which ordinarily occurs in other organs.

The endocardium is only rarely affected primarily by tuberculosis.

There seems to be quite a difference of opinion as to how the tuberculous infection reaches the heart. It is hardly likely that the bacilli are carried by the lymphatic vessels from the tracheobronchial glands, for that would imply a reverse flow of lymph. That is impossible because the lymph vessels are supplied with valves which prevent a reversal of the stream. The more likely routes of spread are therefore either the hematogenous or a contiguous infection.

Tuberculous myocarditis is practically always an accidental finding at autopsy. In the majority of cases no cardiac symptoms have been noticed, and in a good many others, the cardiac signs have been insignificant. It seems almost impossible, therefore, to make a diagnosis of tuberculous myocarditis during life, unless a specific lesion causing a disturbance in the function of the heart results from the nodules.

The prognosis of tuberculosis of the myocardium varies according to the anatomico-pathologic forms, almost always being a secondary lesion which remains in the rear of the clinical picture and has little influence on the prognosis. In some cases, however, on account of the size and seat of the lesion, it may cause a fatal interference with cardiac function.

REPORT OF A CASE

History.—P. P., a colored girl, aged 3 years, who weighed 20 pounds (9,071.8 Gm.), was under our observation for twenty-seven days. The family history was irrelevant for tuberculosis. The patient was born at full term; the delivery was normal; the birth weight was 4½ pounds (2,401 Gm.). She was bottle fed after the third month. She had none of the diseases of childhood. Her present illness began two months before admission with loss of appetite, loss of weight and cough.

Examination.—On physical examination, emaciation was found to be extreme. There were many pea-sized, regular, discrete, but not tender glands, along the anterior borders of the sternocleidomastoid muscles; limited expansion of the chest, especially on the left side, and marked impairment of resonance over the whole left side of the chest and the lower right midaxillary region. The breath sounds on the left were bronchovesicular and very distant, and there were numerous coarse râles throughout the entire chest. The heart appeared to be normal in size and position. The apex beat was in the fifth interspace mid-

clavicular line. The action was regular, and there were no murmurs. The spleen and liver were not felt.

The Mantoux test with tuberculin in a dilution of 1: 1,000 gave strongly positive results. There was a trace of albumin and from 10 to 15 pus cells in the urine. Examination of the blood showed: hemoglobin, 38 per cent; red cells, 3,390,000; white cells, 6,600; polymorphonuclear leukocytes, 35 per cent; small mononuclear cells, 50 per cent; large mononuclear cells, 14 per cent, and eosinophils, 1 per cent.

Roentgen examination of the chest revealed that the shadows of the left lung were evenly dense in the lower half and that there was a large cavity in the upper lobe. A diagnosis of tuberculosis was made.

Course.—A week after admission a bilateral ankle clonus, slight rigidity of the neck and increased reflexes developed. Lumbar puncture yielded a clear fluid containing 1 cell; the globulin was not increased; there was 74 mg. of sugar; the Wassermann reaction was negative. The signs of meningeal irritation cleared up in a few days, but the patient's condition gradually grew worse. She lost weight, and the cough continued. On the day of death, clonic spasms of the left forearm, hand and fingers developed, associated with a slight generalized spasticity. Death occurred while she was in this general hyperspastic condition.

Necropsy.—At postmortem examination, the left lung was found to be adherent to the wall of the chest. The whole upper lobe was a confluent nodular mass, which was caseated and cavitated. This multilocular, soft-walled cavity measured 11 cm. across its greatest diameter, and through its lumen coursed obstructed bronchi and blood vessels. There was a similar but smaller confluent lesion in the lower half of the lower lobe, containing a cavity which measured 4 cm. across. Throughout the remainder of the left and the entire right lung were discrete, occasionally confluent, irregular, caseous, firm, gray nodules. The abdominal and thoracic lymph nodes were converted into caseous masses. A few nodules, similar in character, from 1 to 2 cm. in diameter, were present in the spleen, liver and left kidney. Caseous nodules and ulcers were numerous in the lower part of the ileum and cecum.

The pericardial sac contained 35 cc. of a clear bright yellow fluid. Along the distal half of the left marginal vein and its branches, which coursed along the left border of the left ventricle, were many small grayish-yellow nodules, from 1 to 2 mm. in diameter (fig. 1). The pericardium over these was normal. On careful dissection of the lumina of these vessels, no break could be demonstrated in their walls, although the nodules could be seen through them. When the myocardium about the midportion of the lateral border of the left ventricle was sectioned, an oblong, caseous nodule, 4 mm. in diameter, was found, which, at its most superficial point, was 2 mm. from the epicardium. It extended through to involve a papillary muscle and appeared on the endocardial surface, projecting into the lumen of the left ventricle.

Microscopically, the lesions in the viscera were inflammatory nodules in which necrosis was the prominent feature. They were walled off by a thin layer of collagen fibers (van Gieson's stain) and a slightly wider layer of cells consisting of lymphocytes, epithelioid cells, polymorphonuclear leukocytes, plasma cells and giant cells, the proportion being in the order named. No amyloid was demonstrable by special stains. More than 200 sections and many smears from the fresh caseous material were stained specially, but only a few tubercle bacilli were found in one of the sections from a lymph node. No other parasites were present.

A block of myocardium of the left ventricle, containing the marginal vein and its branches, the tubercles along which they lay and the caseous nodule within the

myocardium, was cut into thin pieces, blocked in paraffin and sectioned. Several sections from each block were studied. The large nodule (fig. 2) lying in the myocardium resembled the ones in the lungs, lymph nodes, spleen, liver and left kidney. Caseation was the characteristic feature. About the caseous material were necrotic and degenerated muscle fibers, a thin layer of collagen, lymphocytes and polyblasts in about equal proportions; a few plasma cells, fibroblasts and polymorphonuclear leukocytes were present. No typical, well formed giant cells of either the Langhan or the foreign body type were observed, although they were present in the lesions in other viscera. The pericardium was intact and normal over this nodule, but the endocardium was completely destroyed so that caseous material was in continuity with the blood stream. About this lesion the intima of many of the vessels was thickened. Some vessels were completely occluded by

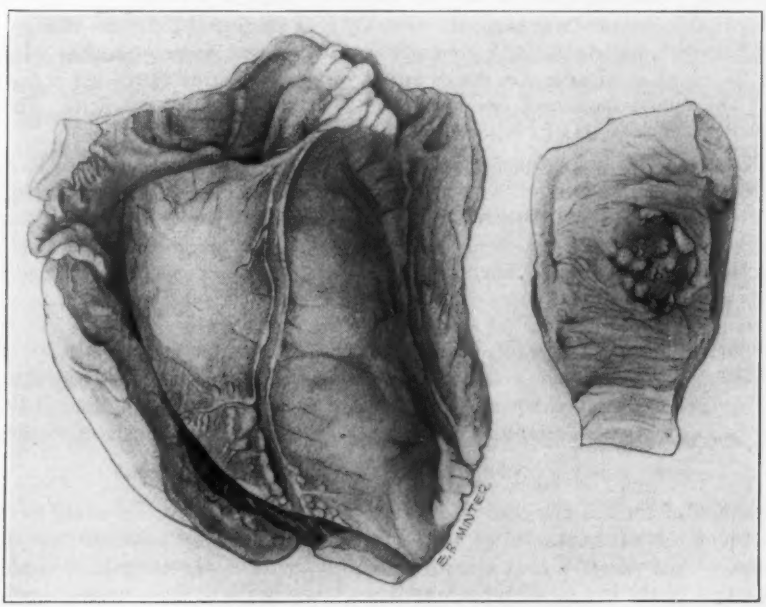

Fig. 1.—Drawing of the heart in which the left marginal vein can be seen running from the base of the heart toward the apex. Along its distal portion and its branches many small nodules can be seen. The figure on the right represents a tangential section through the lateral border of the left ventricle, in which lies a large caseous nodule.

thrombi and proliferated cells. Active migration of cells through the walls of the vessels was observed. The nodules along the marginal vein and branches lay beneath the pericardium and outside the walls of the vessels (fig. 3). Similar lesions were present adjacent to several small arteries and veins well within the substance of the muscle. They had the appearance of being fresh and recent. There was no caseation. The lesions consisted of loosely arranged collections of cells similar in kind and proportion to the ones observed about the necrotic lesion. They did not have the compactness or the circular distribution characteristic of a miliary tubercle. In none of the many sections examined was there a break in the pericardium or an involvement of the walls of a vessel by a nodule.

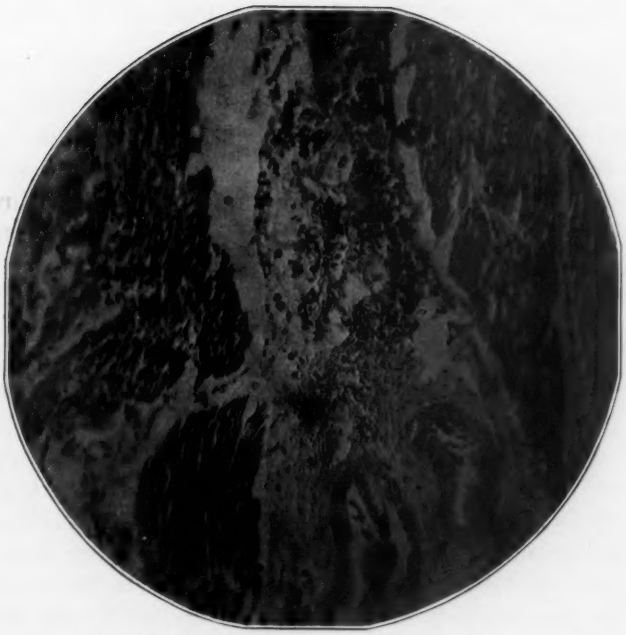

Fig. 2.—A section through the myocardium. A small fresh nodular collection of cells can be seen adjacent to two vessels, the walls of which are intact; × 200.

Fig. 3.—A section through the caseous nodule in the wall of the heart involving a papillary muscle. The endocardium on the left of the section is necrotic; × 100.

COMMENT

The diagnosis of tuberculous myocarditis in this case is firmly established. The clinical picture, the negative Wassermann reaction, the type of involvement of the various organs, the histology of the lesion, the absence of any other parasite such as Blastomyces or Actinomyces and the finding of tubercle bacilli in a lymph node are sufficient data on which to base a positive diagnosis.

The route is not so clearly marked by which tubercle bacilli gained entrance to the myocardium and caused the large caseous lesion. The direction of the flow of blood in the marginal vein of the heart precludes the possibilty that the distribution was by that means. The involvement did not result from a direct extension of a tuberculous infection of the pericardium into the muscle, such as has been reported (Crawford [7] and Weiss [8]), or by direct continuity from a caseating mediastinal lymph node (Anders [9]). There are two possibilities left: The large caseous lesion, which was undoubtedly the earliest, was seeded either by tubercle bacilli that lodged on the endocardial surface of the left ventricle or by organisms carried by the circumflex branches of the coronary artery. The latter is feasible, because infarcts occur in this region as the result of occlusion of the circumflex branches. Evidence in favor of the former route is that the caseation involved the endocardium over such a large area that it might easily have started in it. The fresher lesions along the vessels in which the absence of caseation practically proves them to have been less than two weeks old (Medlar [10]) might have been seeded later on by way of the circumflex branches, or by way of the lymphatics in the myocardium in which the direction of flow is from the depth of the heart to its exterior (Kampmeier [11]). They may have arisen as daughter tubercles, formed by phagocytes carrying living tubercle bacilli a short distance away from the caseous lesion and depositing them where another tubercle formed.

In the adult type of tuberculosis the lymph nodes are not involved, the lesions are nodose, and the cavities are well healed. In the child-

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7. Crawford, B. L.: Case of Tuberculosis in Which Lesion is Confined to Pleura, Pericardium and Myocardium, Proc. Path. Soc., Philadelphia **29**:50, 1926-1927.

8. Weiss, Edward: Tuberculosis of the Heart, Arch. Int. Med. **29**:64 (Jan.) 1922.

9. Anders, J. M.: Tuberculosis of the Myocardium, J. A. M. A. **39**:1081 (Nov. 1) 1902.

10. Medlar, E. M.: A Study of the Process of Caseation in Tuberculosis, Am. J. Path. **2**:275, 1926; Giant Cells and Their Relation to Caseation in Tuberculosis, ibid. **2**:291, 1926.

11. Kampmeier, O. F.: On the Lymph Flow of the Human Heart, Am. Heart J. **4**:210 (Dec.) 1928.

hood type, there are massive areas of caseation, soft-walled ragged cavities with little or no fibrosis and large caseous lymph nodes. From a study of the clinical course and autopsy material, the case reported should be regarded as the childhood type with the probable primary focus in the intestinal tract (Brown and Sampson [12]), for the lesions in the intestine were more fibrotic than any others and therefore were definitely older.

Occasionally the tuberculous child comes to autopsy with miliary lesions. Aschoff [13] expressed the belief that miliary tuberculosis is an accident, and that it results from the formation of an intimal tubercle in a vessel; the tubercle ruptures and pours out caseous material and bacilli into the blood stream, which deposits them in the organs. However, that other factors are necessary was demonstrated by the case reported. There was a caseous nodule in the heart which ruptured into the left ventricle, and yet there was no miliary tuberculosis. This certainly suggests that miliary tuberculosis is the reaction of a more or less resistant host, that is, the resistance is so great that the bacilli, as they lodge, are immediately phagocytosed without the formation of a tubercle, or it is so low that no tubercle is formed.

To base conclusions concerning resistance on morphologic grounds is to establish a shaky premise. However, the myocardium is notoriously resistant to infection by tubercle bacilli, so that it seems safe to assume that the resistance in the case reported was low, which leads to the assumption that miliary tubercles are the reaction of a host resistant to tuberculosis. The fact that no typical giant cells were found about the myocardial lesions and few about the lesions in other viscera is further evidence of a low resistance (Medlar [10]).

There are no figures on the prognosis of tuberculous myocarditis, but there has been practically no evidence that healing of such a lesion has ever occurred.

CONCLUSIONS

A clinical and pathologic study has been made of a tuberculous lesion of the myocardium which resulted from the implantation of tubercle bacilli carried probably by the circumflex branches of the left coronary artery, or by a direct inoculation of the organisms on the endocardium of the heart.

2022 Spruce Street.

4600 Spruce Street.

12. Brown, Lawrason, and Sampson, H. L.: Intestinal Tuberculosis: Its Importance, Diagnosis and Treatment, ed. 2, Philadelphia, Lea & Febiger, 1930.

13. Aschoff, L.: Lectures on Pathology, New York, Paul B. Roeber, Inc., 1924, p. 34.

PNEUMOTHORAX

TREATMENT BY MEANS OF CONTINUOUS SUCTION

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It is generally accepted that the prognosis of spontaneous pneumothorax is favorable both as to life and as to the duration of illness.[1] However, there are some cases that do not follow the general rule. Tidestrom [2] reported a case in which the lung never reexpanded. Numerous plastic operations were performed on it over a period of seventeen years. Fenechel [3] reported two cases of pneumothorax, one caused by the intracardiac injection of epinephrine and the other by thoracentesis, in which the patients died shortly afterward as a result of these accidents.

Palmer and Taft [4] stated that the usual duration of uncomplicated spontaneous pneumothorax with no pathologic change in the lung is from two weeks to two months, but that it may be much longer. They cited cases that lasted for sixteen months and twenty years.

Harvey [5] reported a case in which 1,000 cc. of air was aspirated daily, with improvement. The aspirations were not continued, and after six months the pneumothorax remained the same. In commenting on the case, he stated that the right lung would probably never reexpand.

The usual expectant treatment consisting of the control of the cough, the strapping of the chest and the insertion of a cannula if the intrathoracic pressure increases is obviously insufficient in such exceptional cases. The prolonged duration of illness is usually due to a valvelike formation which allows air to enter the pleural cavity on

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From the Children's Hospital.

1. Phillips, John: Pneumothorax, in Cecil: Text Book of Medicine, Philadelphia, W. B. Saunders Company, 1927, p. 856. Emmerson, C. P.: Diseases of the Pleura, in Tice: Practice of Medicine, Hagerstown, Md., W. F. Prior Company, vol. 5, p. 646.

2. Tidestrom, H.: A Case of Spontaneous Pneumothorax in a Child Ten Days Old, Acta paediat. **4**:380 (Aug.) 1925.

3. Fenechel, Nathan: Tension Pneumothorax with Subcutaneous Emphysema, J. A. M. A. **97**:20 (July 4) 1931.

4. Palmer, J. P., and Taft, Robert B.: Spontaneous Pneumothorax, J. A. M. A. **96**:653 (Feb. 28) 1931.

5. Harvey, Joseph L.: Accidental Pneumothorax, J. A. M. A. **94**:21 (Jan. 4) 1930.

inspiration and prevents its escape by closing on expiration (valvular pneumothorax). The treatment used in the case reported seems useful in this type of pneumothorax.

REPORT OF A CASE

D. C., a white boy, aged 2½ years, was admitted to the Buffalo Children's Hospital on Sept. 2, 1930, because of a cough and fever that had been present since August 28.

The family history was unimportant. The child was born at term, with a forceps delivery. He was healthy at birth, and the development was normal. He was first seen in the hospital on Oct. 19, 1929, with acute poliomyelitis, which left him with a residual paralysis of both legs. In May, 1930, he had scarlet fever.

On August 28, cough, fever, difficulty in respiration and diarrhea developed. Physical examination revealed a well nourished, pale and restless child. The respiratory rate was 40, the pulse rate, 150 and the temperature, 102 F. A purulent discharge was seen in the left auditory canal, and the throat was injected. Decreased expansion of the left lung and bulging of the interspaces were noted. The apex of the heart was shifted to the right. A test with tuberculin gave a negative reaction. A roentgenogram showed density of the left side of the chest due to fluid.

A thoracentesis was performed, and 20 cc. of a thin greenish-yellow fluid was withdrawn. On September 12, another thoracentesis was attempted. No fluid was obtained, but air was withdrawn. A roentgenogram taken on this day showed a pneumothorax of the left side of the chest.

The child was treated expectantly until April 4, 1931 (for eight months). A roentgenogram taken on this date showed a complete pneumothorax of the left side of the chest (fig. 1).

On April 4, a needle was inserted with a tube connected to a water manometer. The manometer registered from plus 300 mm. of water (22.2 mm. of mercury) to minus 300 mm. of water (22.2 mm. of mercury), owing mainly to the forced inspiration and expiration of crying.

On April 5, a trocar was inserted and strapped to the wall of the chest with adhesive tape. Suction equivalent to 20 mm. of mercury was applied through the trocar, the apparatus described in this paper being used. Prior to the application of suction, the manometer showed a pressure of from plus 10 mm. to minus 10 mm. of mercury. After a liter of air was removed from the chest by suction, the manometer fluctuated slightly, even when the suction was discontinued. A roentgenogram made on April 6 showed the air cavity to be slightly smaller.

For the next twenty days the suction was used constantly. Each day about 200 cc. of air was withdrawn. Suction was discontinued on April 26 (fig. 2).

Roentgenograms taken during this time showed the pneumothorax cavity was reducing in size. After the suction process was discontinued, the pneumothorax cavity continued to reduce until July 23, when a roentgenogram showed that no air remained in the pleural cavity (figs. 3 *A* and *B* and 4).

APPARATUS

The apparatus is easily constructed from the material found about any hospital laboratory. It is quickly assembled around the frame of a bedside table.

A 4 liter bottle (*B*), 30.5 cm. in height and 46.5 cm. in circumference, is made into a "bell" by removing the bottom. This is done by tying a string previously

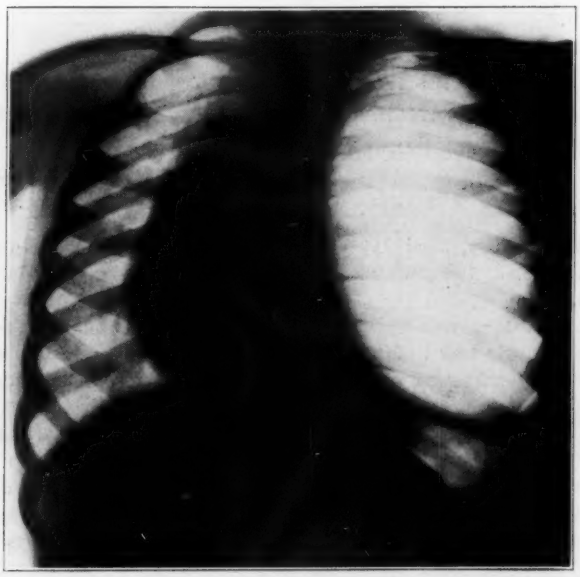

Fig. 1.—Complete pneumothorax of the left side of the chest. The heart is pushed to the right side. The roentgenogram was taken eight months after the onset of the pneumothorax, before the treatment was started.

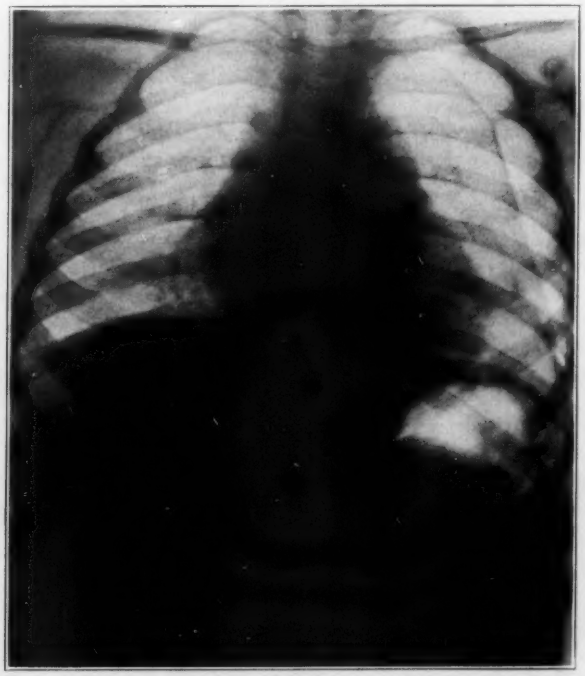

Fig. 2.—Lung returning to the wall of the chest and the heart in the normal position. The roentgenogram was taken sixty-two days after the treatment was started.

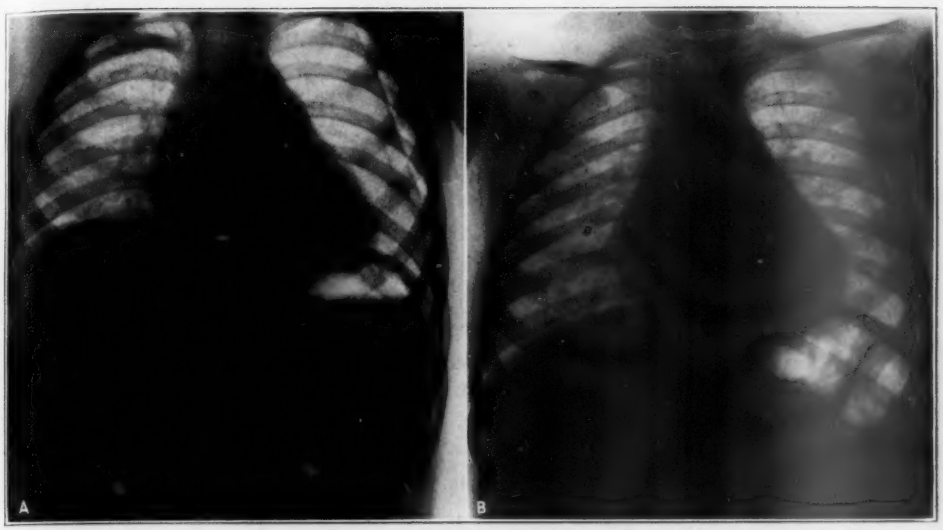

Fig. 3.—*A* and *B*, roentgenograms of chest taken seventy and seventy-eight days, respectively, after inception of treatment, showing improvement.

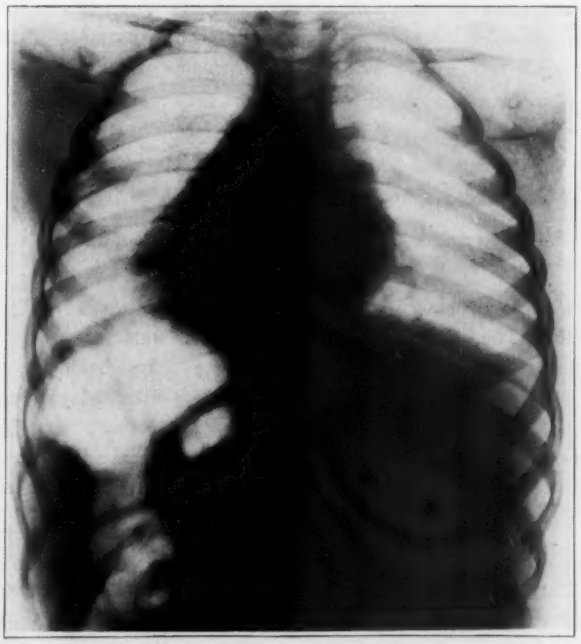

Fig. 4.—Roentgenograms taken one hundred and eight days after treatment was begun, showing a normal chest.

saturated with alcohol about the circumference of the bottle near the bottom and then lighting the string.

This bottle or "bell" is provided with a rubber stopper (*D*) with two holes. In one of these holes is placed a glass tube (*F*) which extends just through the stopper, and a glass rod (*E*) is placed in the other hole. To the glass tube (*F*) a rubber tube (*G*) is connected; this leads to a T-tube (*H*) to which is attached a manometer (*I*). A rubber tube (*S*) connects the T-tube to a short length of glass tubing (*K*), which makes it possible to remove rubber tube (*T*) from the rest of the apparatus after it is clamped with a hemostat (in order that roentgenograms of the patient may be taken). A metal adapter (*L*) is attached to tube (*T*) to which is attached the trocar (*N*).

The trocar (*N*), which is 20 gage and 3 cm. in length, is provided with a flange (*M*), 1.5 by 2.5 cm. The flange helps to retain the position of the trocar when it is strapped against the chest with adhesive tape.

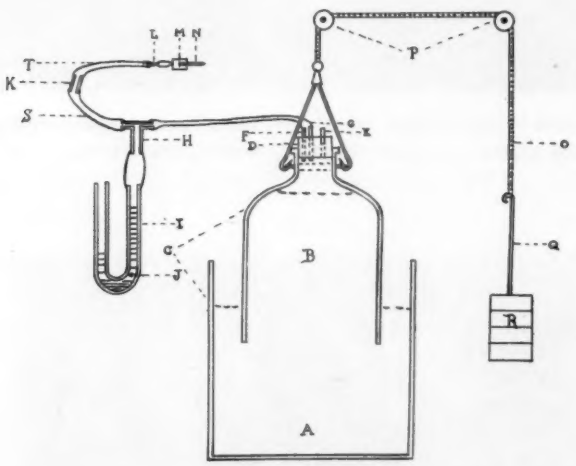

Fig. 5.—Diagram of apparatus employed for continuous suction.

The bottle (*B*) is submerged in water. After the bottle is filled, the glass rod (*E*) is inserted. The bottle (*B*) is raised out of the water except for a portion of a few centimeters. The position is maintained by counterbalancing weights (*R*) attached to a pulley cord (*O*) the end of which is attached to the neck of the bottle (*B*).

The height of the column of water within the bottle above the level of the water outside produces a negative pressure equal to the height of the column.

COMMENT

From the case reported it will be seen that the patient, who was treated expectantly for eight months, grew gradually worse. When he was treated by continuous suction he improved immediately and complete cure was obtained in one hundred and eight days.

Obviously, closure of the sinus causing the pneumothorax to persist was facilitated by the suction, instead of the reverse, as stated by many writers.[6]

Normally, the intrapleural pressure is minus 5 mm. of mercury on expiration and minus 10 mm. on inspiration. The minus sign indicates that the pressure is negative or subatmospheric. It is suction pressure.[7]

In pneumothorax, the intrapleural pressure becomes equal to atmospheric pressure; in the valvular type, it is above atmospheric pressure.[8] By attaching a suction apparatus to a pneumothorax the normal negative pressure is restored. In the case reported, a continuous negative pressure of about minus 20 mm. of mercury was employed in order to break adhesions that might have formed. This pressure can be regulated according to the individual case.

Active aspiration has been disapproved of since the publication of Samuel West's [9] article in 1904. The following are his arguments why aspiration is undesirable:

1. The suction employed will stretch the lung and put a strain on the weak spot which has just closed.

2. The aspirator may draw into the pleura some infective secretion from the lung, thereby causing empyema.

No doubt, these are excellent arguments against aspiration with a large amount of suction when the amount of negative pressure is unknown, as in aspiration with a syringe. When the pressure can be controlled, neither of the aforementioned accidents will occur.

Devices to create a negative intrapleural pressure in pneumothorax usually consist of a needle inserted into the pneumothorax with some valvular arrangement to allow air to escape on expiration and to prevent its entrance on inspiration.

Samuel West [10] and Banks [11] described trocars on to which rubber tubes are attached. In the former's device, the free end of the rubber tube opened under water, thus forming a water valve. In the latter's

6. West, S.: Paracentesis and the Use of the Aspirator in Pneumothorax, Lancet **1**:751 (March 12) 1904. Lord, F. T.: Pneumothorax, Diseases of the Bronchi, Lungs and Pleura, Philadelphia, Lea & Febiger, 1915, p. 588.

7. Macleod, J. J. R.: Physiology and Biochemistry in Modern Medicine, St. Louis, C. B. Mosby Company, 1922, p. 321.

8. Fenechel, Nathan: Tension Pneumothorax, J. A. M. A. **97**:21 (July 4) 1931.

9. West, Samuel: On Paracentesis and the Use of the Aspirator in Pneumothorax, Lancet **1**:751 (March 12) 1904.

10. West, Samuel: Case of Pyopneumothorax of Several Months' Duration Cured by Free Incision: With Some Remarks on the Surgical Treatment of Pneumothorax, Brit. M. J. **2**:1570 (Nov. 27) 1897.

11. Banks, H.: Traumatic Bilateral Pneumothorax: A Simple Method of Treatment, Brit. M. J. **2**:954 (Nov. 23) 1929.

device the tube was pinched on inspiration and opened on expiration. After twenty breaths the trocar is removed.

Biggers [12] described a trocar similar to one described by Crowdy [13] in which a trocar is inserted into the pneumothorax and a rubber dam (or goldbeater's skin, as in Crowdy's trocar) is stretched across the external orifice, which acts as a valve to allow air to blow the material away from the orifice on expiration and thus escape. On inspiration the material is sucked into the orifice, preventing more air from entering the pleural cavity.

The objection to these contrivances is that the intrapleural pressure is not controlled. If the sinus is large, respiration would necessarily have to be rapid to exhaust the air present in order to create a negative intrapleural pressure. This excessive use of the chest prevents the sinus from closing. If the sinus were small or closed, superfluous negative pressure could be formed, thus reopening a closed sinus or aspirating infected material into the pleural cavity. In the fluid valve type, in addition to the other objections water could be aspirated into the pleural cavity.

The advantages of the apparatus herein described are as follows:

1. There is an active, continued suction not dependent on respiration.

2. The amount of negative pressure in the chest is measured, and can be controlled at all times.

3. The apparatus provides for continuous suction which can never become excessive but which removes large amounts of air from a pleural cavity without requiring a great deal of attention.

CONCLUSION

The apparatus described is of value in the treatment for valvular pneumothorax.

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12. Biggers, I. A.: A Cannula for Use in the Treatment of Spontaneous or Accidental Pneumothorax, J. A. M. A. **95**:935 (Sept. 27) 1930.

13. Crowdy, F. D.: Pneumothorax: Repeated Paracentesis: Incision: Recovery, Brit. M. J. **1**:367 (Feb. 5) 1898.

STAPHYLOCOCCUS AUREUS MENINGITIS

TREATMENT WITH SPECIFIC BACTERIOPHAGE

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The septic meningitides, including infections of the meninges due to various forms of staphylococci, streptococci, pneumococci and influenza bacilli, are, unfortunately, discussed in the literature more frequently as a group than in separate categories based on the causal organisms.

Griffith [1] considered these cases in the new-born as complications of umbilical infection, and in older children as secondary to otitis media, empyema, erysipelas and joint infection and usually associated with sepsis elsewhere in the body. As to termination, he stated that these cases run a "short course and the prognosis is almost entirely unfavorable." Treatment for the streptococcic and pneumococcic varieties by intraspinal serum injection was mentioned; frequent drainage of the canal by lumbar puncture and intraspinal injections of methenamine were suggested in other types.

Porter and Carter [2] stated that "in staphylococcic meningitis, treatment is essentially symptomatic and invariably useless." Holt [3] too gave the treatment for this form as symptomatic, and stated that the "course is usually rapidly progressive and terminates almost invariably in death."

Although some instances of recovery from staphylococcic meningitis are reported in the medical literature, careful analysis reveals that, with the exception of one doubtful case (to be described later), they are not

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1. Griffith, J. P. C., and Mitchell, A. G.: Diseases of Infants and Children, ed. 2, Philadelphia, W. B. Saunders Company, 1927, vol. 2, p. 315.

2. Porter, Langley, and Carter, William: Management of the Sick Infant, ed. 3, St. Louis, C. V. Mosby Company, 1927, p. 315.

3. Holt, L. Emmet: Diseases of Infancy and Childhood, ed. 9, New York, D. Appleton and Company, 1918, p. 720.

true, generalized meningeal infection but involvement within a circumscribed area, arising from staphylococcic infection in adjacent tissue.

Emerson [4] has reported a case of localized abscess in a girl of 12 years, involving the meninges at the level of the lower dorsal and upper lumbar vertebrae, in which thick pus was obtained and drained by laminectomy. The vertebral suppuration was evidently preceded and followed by Staphylococcus aureus osteomyelitis elsewhere in the body. Although this patient recovered, Emerson emphasized the fatal prognosis of staphylococcic meningitis.

Ballenger [5] described a case of staphylococcic meningitis, secondary to frontal sinusitis, in which recovery followed surgical drainage of the focus. He commented on the paucity of data regarding staphylococcic meningitis, and deplored the habit of grouping all nonmeningococcus and nontuberculous meningitic inflammations as "septic meningitis" and considering them in toto.

Garber [6] mentioned a case of staphylococcic meningitis, evidently an extension from a secondary sacral osteomyelitis, which was distinctly localized and cleared up under surgical measures.

Sciaroni [7] reported an instance, in a boy of 16 years, in which an abscess into the spinal canal, containing thick Staphylococcus aureus pus, was drained by laminectomy of the second lumbar vertebra and recovery ensued. No data on the spinal fluid, other than the one positive culture for Staphylococcus aureus, are given.

Wharry [8] removed the lamina cribrosa and, by direct drainage, produced recovery in a Staphylococcus aureus meningitis caused by the extension of suppuration from an otitis media through the labyrinth and lamina cribrosa into the internal auditory meatus and thence to the basal meninges. He stated that not over 2 or 3 per cent of patients with meningitis of otitic origin in whose spinal fluid pus cells and organisms are found recover, whatever surgical or other procedures are employed.

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4. Emerson, Kendall: Staphylococcus Infection of Spinal Meninges, Boston M. & S. J. **196**:465 (March 24) 1927.

5. Ballenger, Howard C.: Meningitis (Staphylococcus Aureus) Secondary to Frontal Sinusitis, J. A. M. A. **94**:1040 (April 15) 1930.

6. Garber, Frank W., Jr.: Staphylococcus Meningitis Limited to Spinal Canal, J. Michigan M. Soc. **24**:597 (Nov.) 1925.

7. Sciaroni, George H.: Surgical Treatment of Staphylococcus Meningitis, California & West. Med. **32**:186 (March) 1930.

8. Wharry, H. M.: Three Cases of Middle Ear Disease, Brit. M. J. **1**:85 (Jan. 16) 1926.

Salvani,[9] Lortat-Jacob and Grivot,[10] Moise[11] and Ripley and Thompson[12] reported similar cases. Dandy[13] reported cures, in a series of cases of pneumococcic and streptococcic meningitis, by the operative removal of the occipital bone and continuous drainage of the dura.

It will readily be seen that the cases of staphylococcic infection so far quoted, while perhaps technically meningitis in that the meninges participated in an adjacent suppurative process, scarcely fit into the category of a spreading, generalized infection of the meninges with associated characteristic signs and symptoms.

One exception, with recovery from a Staphylococcus aureus meningitis not of the aforementioned surgical variety, was described by Lamb.[14] This was in an infant with obvious obstructive hydrocephalus, in whom the evidences of meningeal inflammation became manifest in the course of rather vigorous ventricular, cisternal and lumbar drainage aimed at relief of the blockage. Under intraspinal injections of a solution of gentian violet, the case cleared up. Since, however, the highest spinal fluid white cell count was only 105 per cubic millimeter and other counts were considerably less, it is evident that the infection was either so early or of such extremely low virulence that the therapeutic value of the gentian violet can scarcely be judged. Dandy[13] has emphasized that in the septic meningitides, the virulence of the organism is more important than its type. Of the former, the leukocytic response in the spinal canal is certainly a gage.

Additional cases of Staphylococcus aureus meningitis, with fatal termination, have been reported. Wahl[15] discussed rather fully a case in a 19 year old lad with Staphylococcus aureus septicemia, among the complications of which was meningitis. No specific treatment was essayed. This type is not at all infrequent. Cabot[16] reported a case

9. Salvani, C.: Pensiero med. **17**:263 (May 15) 1928.

10. Lortat-Jacob, L., and Grivot, M.: Bull. et mém. Soc. méd. d. hôp. de Paris **44**:1555 (Dec. 17) 1920.

11. Moise, T. S.: Staphylococcus Meningitis, Secondary to Congenital Sacral Sinus, Surg., Gynec. & Obst. **42**:394 (March) 1926.

12. Ripley, Warren, and Thompson, D. Clark: Pilonidal Sinus as a Route of Infection in a Case of Staphylococcus Meningitis, Am. J. Dis. Child. **36**:785 (Oct.) 1928.

13. Dandy, W. E.: Surgical Treatment of Septic Meningitis, Surg., Gynec. & Obst. **39**:760 (Dec.) 1924.

14. Lamb, Frank H.: Report of a Case of Staphylococcus Meningitis Treated with Intraventricular Injections of Gentian Violet, Arch. Pediat. **45**:306 (May) 1928.

15. Wahl, Ernest F.: Staphylococcus Septicemia with Diffuse Involvement of Nervous System, J. Nerv. & Ment. Dis. **67**:351 (April) 1928.

16. Cabot, R. C.: Case Records of Massachusetts General Hospital, Boston M. & S. J. **195**:999 (Nov. 18) 1926.

of Staphylococcus aureus meningitis, complicating spinal syphilis, in an adult. That this was probably due to a staphylococcic otitis media was revealed at autopsy. Xanthochromic spinal fluid was obtained at the second lumbar puncture. White blood cells, in various spinal fluid specimens, ranged from 800 to 2,100 per cubic millimeter, with neutrophils strongly preponderating.

It appears that staphylococcic meningitides are divisible into the following categories:

1. Localized abscess involving the meninges and caused by an extension of suppuration from contiguous structures. This may be afforded opportunity for recovery by surgical measures.

2. Meningitis occurring in the course of a general staphylococcus septicemia, the prognosis being invariably fatal.

3. Meningitis accompanied by characteristic systemic evidences of cerebrospinal inflammation, with distinct spinal fluid responses including positive cultures of Staphylococcus aureus. This is evidently of hematogenous origin and most frequently secondary to staphylococcic infection in noncontiguous parts of the body. In cases of this frank type, no recovery has been reported.

4. Noncharacteristic meningitis (one case) of an exceedingly mild type, with recovery following the use of gentian violet. In the case observed, the evidences of the infection arose in the frequent entrance into the meninges during the course of relief from blockage in an already developed hydrocephalus.

REPORT OF A CASE

On the afternoon of July 18, 1931, I was called to the home of a boy, 13 years old. According to the mother he was quite well until four days earlier, when he seemed less active than usual and complained occasionally of pain in the small of the back. On the following morning, he seemed well but, toward evening, again complained of some pain in the lumbar region and a slight headache. The next morning, after having slept quietly, he arose with more headache, ate his breakfast and, a few minutes later, vomited the meal. He was given a tablespoonful of castor oil, some of which may have been retained. Later in the day he voluntarily went to bed, seemed apathetic and vomited everything ingested thereafter. His apathy increased, his headache became more pronounced and, by the morning of the day on which he was examined, marked opisthotonos and retraction of the head had begun rapidly to develop.

The previous medical history included artificial feeding in infancy, with rickets; measles at 6 years; German measles at the age of 8; occasional enuresis; a poor record of school progress and behavior, and a tendency to "boils," one of which, of rather large size (according to the mother), had occurred over the left tibia three weeks earlier, and was opened and drained after a day of fever and localized pain, redness and swelling.

Examination showed a very tall and thin, but wiry, boy. He was arched into a position of extreme opisthotonos on the right side. The head was hyperextended,

the occiput being drawn between the shoulder-blades. The patient was semi-stuporous, replying vaguely to repeated interrogation. The temperature was 102.2 F. and the pulse rate 94; respirations numbered 24 per minute. An ambulance was immediately sent for and, within a half hour, the patient was admitted to the Jewish Hospital.

On his admission, in addition to the foregoing findings, the following were noted: The pupils were equal and reacted to light and in accommodation; a distinct left-sided and slight right-sided nystagmus was observed. The tongue was coated; the tonsils and pharynx were slightly injected. There were several decayed teeth. No antero-posterior motion of the neck could be elicited; lateral motion of the head, while limited by the accessory muscle involvement, persisted. The chest was normal but for a slight untransmitted systolic apical murmur. The abdomen showed tense and tender recti, due to the extreme opisthotonos. A small granulating ulcer, one-half inch (1.2 cm.) in diameter, was found on the anterior surface of the left tibia, but no pus was present. There were areas of skin hyperesthesia, particularly about the abdomen. The knee jerks were markedly increased; the Brudzinski sign was positive; the Babinski reflex and ankle clonus were negative. Kernig's sign was positive to such a degree that it was scarcely possible to bring the thighs up on the abdomen, much less to extend the legs. Findings in the upper extremities were negative.

On the afternoon of the patient's admission to the hospital a blood count showed: red blood cells, 4,550,000; white blood cells, 12,100; neutrophils, 88 per cent, and lymphocytes, 12 per cent. Following a spinal tap, 20 cc. of turbid colorless fluid was removed, under slightly increased pressure; the cell count was 6,000 per cubic millimeter, the globulin markedly increased and Fehling's solution not reduced. A smear showed only neutrophils. A culture was made. Fifteen cubic centimeters of antimeningococcic serum was injected into the canal. Examination of the nose, throat and ears (Dr. A. Spencer Kauffman) and of the eye-grounds (Dr. A. Brav) furnished no additional significant data.

On the patient's second day in the hospital, the temperature ranged between 100 and 102 F., and the signs of meningeal irritation were more marked, except that the vomiting ceased. Two spinal taps were made, twelve hours apart. The first specimen, 20 cc. in amount and obtained under a slight increase in pressure, contained 5,000 pus cells per cubic millimeter plus a few clumps. It was replaced by 15 cc. of antimeningococcic serum. At the later tap, only 5 cc. of fluid was obtained, containing 5,500 pus cells per cubic millimeter; this was replaced by 5 cc. of antimeningococcic serum injected intraspinally, and 15 cc. was injected intramuscularly. Both specimens showed heavy globulin, and no sugar reduction. Both were cultured, one anaerobically for Bacillus tetani. Cultures were obtained from the nose, throat and blood.

On the third day, the condition of the patient was practically unchanged; he was probably a little clearer mentally, but lay in the typical "gun-hammer" position. Spinal fluid was removed twice, the first specimen (20 cc.) showing a count of 2,500 cells with many large clumps. Cultures were made of this fluid. The second specimen was examined for tubercle bacilli and none found. Guinea-pig inoculation was performed. This specimen contained 4,500 white blood cells per cubic millimeter and some clumps. Both withdrawals were followed by the intraspinal injection of 15 cc. of antimeningococcic serum and one intramuscular injection of 15 cc. A blood count gave substantially the same results as on the patient's admission, except for a rise in white cells from 12,100 to 14,000.

On the fourth day the patient's condition was unchanged; the opisthotonos was at its maximum, while the mentality seemed relatively clear. The first spinal

tap yielded 20 cc., with a cell count of 2,500 plus many clumps. At the second tap the fluid contained 6,500 polymorphonuclear leukocytes per cubic millimeter. Both specimens were slightly yellow; each was replaced by 15 cc. of antimeningococcic serum. A blood culture, made two days earlier, was reported sterile; a throat culture, made at the same time, was now reported as showing a growth in which Staphylococcus aureus predominated, with Micrococcus tetragenus and occasional streptococci present. Another blood culture was taken. The first spinal fluid culture, made on the day of admission, was now reported as showing a pure growth of Staphylococcus aureus.

When, on the morning of the patient's fifth day in the hospital, reports were received from the laboratory that spinal fluid cultures made on the second and third days were likewise found to show pure growths of Staphylococcus aureus, 30 cc. of yellowish, turbid spinal fluid was withdrawn and 5 cc. of Staphylococcus aureus bacteriophage [17] was injected into the canal. In the afternoon, the temperature attained a maximum of 103.2 F., and the pulse rate was 124. The patient complained of a slight headache; he was flushed and seemed a trifle more toxic. In the evening another 20 cc. of turbid yellow spinal fluid was withdrawn and replaced by 10 cc. of the bacteriophage. It is worth noting that the xanthochromic spinal fluid was of precisely the same tint as the bacteriophage preparation. The morning fluid contained 4,500 pus cells, and the evening fluid (withdrawn eight hours after the first use of bacteriophage) 5,100 cells per cubic millimeter.

On the following (sixth) day, while the child appeared flushed and toxic and the temperature remained near 102 F. all day, there was a slight but unmistakable decrease in the nuchal and general muscular rigidity. The child ate well. The laboratory report stated that the cultures of the spinal fluid on the fourth day in the hospital, and of the morning specimen on the fifth day, were positive for Staphylococcus aureus. Two spinal taps were made, 20 cc. being withdrawn each time, under practically normal pressure. The morning specimen showed a count of 2,800 neutrophils. The afternoon specimen, cultured at the bedside, showed a heavy coagulum formation after the test tube was allowed to stand for ten minutes. A portion of this, tested by Gruskin's [18] starch-iodine method, gave the maximum reaction intensity for meningitis. Every spinal fluid specimen to date showed a marked increase in globulin content and no sugar reduction. The laboratory work was done under the direction of Dr. E. Steinfield.

On the seventh and eighth days, the toxic symptoms were gone. The temperature was between 101 and 102 F., with a pulse and respiratory rate in proportion. These gradually subsided and remained normal after the twelfth day in the hospital.

On the seventh day, and thereafter until the twelfth day, the spinal canal was drained twice daily, from 18 to 40 cc. being withdrawn and from 10 to 15 cc. of bacteriophage being instilled each time. One tap and instillation was made on the thirteenth day, and drainage alone (without the injection of bacteriophage) was done once on the fourteenth and once on the fifteenth day. Cultures of the spinal fluid made the day following the inception of bacteriophage therapy, and each day thereafter, proved absolutely sterile.

On the seventh day, the spinal fluid showed a cell count of 2,000, with no clumps. The count gradually dropped, each day showing a distinct decrease; on the ninth day it was 1,200 (88 per cent polymorphonuclears and 12 per cent lymphocytes), and on the eleventh day, 800 (62 per cent polymorphonuclears and 38 per cent

17. Staphylococcus aureus bacteriophage (no. 2) of Swan-Myers.

18. Gruskin, B.: Studies in Cerebrospinal Fluid, Am. J. Clin. Path. **1**:441 (Nov.) 1931.

lymphocytes). Fehling's solution failed to reduce until the fifteenth day; the globulin content was still above normal at the last examination.

There appeared to be a slight remission in the spinal fluid leukocytosis in the morning specimens on the third and fourth days. However, the laboratory reports of "many heavy cell clumps," in addition to the cells counted, would readily account for such an apparent discrepancy.

The guinea-pig inoculation, anaerobic culture for B. tetanus and the second blood culture all gave negative results. The urine showed acetone all along, but was otherwise normal except for occasional faint traces of albumin and a few casts.

During the second week a steady decrease was observed in the spastic manifestations. The child was comfortable, developed a voracious appetite and, by the middle of the third week, was on the roof garden in a wheel chair. He was discharged, perfectly well and with no sequelae, twenty-three days after his admission to the hospital. When examined three weeks later, he was active and in the best of health, having gained 11 pounds (5 Kg.).

In 1915 Twort,[19] and in 1917 d'Herelle,[20] described bacteriolysis, produced in vitro by a filtrable principle elaborated at the expense of the destroyed organism and since known as the Twort-d'Herelle phenomenon. This has been most elaborately studied by d'Herelle,[21] and in the ensuing years a vast compilation of data has been published, dealing with the nature and characteristics of the active agent or phage,[22] as well as its clinical applications.[23]

Probably the best exposition of the theories and trials and results of bacteriophagic action is to be found in two lectures, of rather recent date, given by d'Herelle himself [24] and by Bruynoghe.[25] Both offered rather conclusive data to show that the bacteriophage is not an enzyme or an elaboration of the destroyed bacteria, but a living filtrable virus, corpuscular in shape and about one-tenth the diameter of the smallest

19. Twort, F. W.: An Investigation into the Nature of Ultramicroscopic Viruses, Lancet **2**:1241, 1915.

20. d'Herelle, F.: Compt. rend. Acad. d. sc. **165**:373, 1917.

21. d'Herelle, F.: The Bacteriophage, Baltimore, Williams & Wilkins Company, 1922; Bacteriophage and Its Behavior, Baltimore, Williams & Wilkins Company, 1926, p. 269.

22. Bastin, A. H. C. P.: Le phénomène de d'Herelle, Thèse de Lille, Leblanc and Durant, 1922, p. 112. Muckenfuss, Ralph S.: Studies on the Bacteriophage of d'Herelle, J. Exper. Med. **48**:709 (Nov. 1) 1928. McKinley, Earl, and Cámara, Julia: Resistance of Staphylococcus Hemolyticus to Bacteriophage, Proc. Soc. Exper. Biol. & Med. **27**:846, 1930. Hauduroy: Le bactériophage de d'Herelle, Paris, Le François, 1925, p. 212. Clifton, C. E.: Photodynamic Action of Certain Dyes on the Inactivation of Staphylococcus Bacteriophage, Proc. Soc. Exper. Biol. & Med. **28**:745 (April) 1931. McKinley, E. B., and Douglass, M.: Adsorption of Staphylococcus Bacteriophage by Serum Globulins, Proc. Soc. Exper. Biol. & Med. **27**:844, 1930.

23. Rice, Thurman B., and Harvey, Verne K.: Therapeutic Use of Bacteriophage in Suppurative Conditions, J. Lab. & Clin. Med. **14**:1 (Oct.) 1928.

24. d'Herelle, F.: Autolysis and Bacteriophagis, J. State Med. **31**:461 (Oct.) 1923.

25. Bruynoghe, R.: Twort-d'Herelle Phenomenon (Harben Lectures), J. State Med. **35**:683 (Dec.) 1927.

bacterium visible under the microscope; the last-mentioned data were confirmed by the German chemicophysicist, Bechold, who both observed and photographed these bodies by means of the ultramicroscope. D'Herelle and Bruynoghe both claimed that these bodies are capable of multiplication, have powers of assimilation in a heterogenous medium and are susceptible of adaptation to unfavorable conditions, three criteria of living matter. In a sweeping dictum, toward the proof of which much evidence is offered, d'Herelle insisted that recovery from infectious disease depends on the development and effect of specific bacteriophages; that, for example, what are referred to as opsonins are actually lysins secreted by bacteriophage corpuscles during active bacteriophagy.[26]

While there are, apparently, many diseases of infectious nature for which bacteriophage treatment has been employed with success, as reviewed by Schultz,[27] one of the most common clinical applications, and the one with the most uniformly gratifying results, has been in the field of staphylococcic infections.

The existence of a staphylococcus bacteriophage was demonstrated by Gratia [28] in 1921, since when its characteristics have been further studied by him and by many other observers.[29]

In staphylococcic boils, abscesses, carbuncles, acne, sycosis, ulcers, wounds, osteomyelitis and urinary infections this treatment has been used with great success, according to published reports,[30] many writers

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26. d'Herelle, F.: Bacteriophage in Relation to the Phenomena of Recovery, Internat. Clin. **1**:37, 1929.

27. Schultz, E. W.: The Bacteriophage as a Therapeutic Agent, California & West. Med. **31**:5 (July) 1929.

28. Gratia, A.: Preliminary Report on a Staphylococcus Bacteriophage, Proc. Soc. Exper. Biol. & Med. **18**:217, 1921.

29. Gratia, A.: La lyse transmissible du staphylocoque, Compt. rend. Soc. de biol. **86**:276, 1924. Callow, Bessie R.: Further Studies on Staphylococcus Bacteriophage, J. Infect. Dis. **41**:124 (Aug.) 1927. Eaton, Monroe D., Jr.: Quantitative Study of Respiration of Staphylococcus Cultures Lysed by Bacteriophage, J. Bact. **21**:143 (March) 1931. Gratia, A., and Mutsaars, Wiley: Inhibiting Effect of Normal Serum, Compt. rend. Soc. de biol. **105**:943, 1926.

30. Bruynoghe, E.: Essais de thérapeutique au moyen du bactériophage, Compt. rend. Soc. de biol. **85**:1120, 1921. Bazy, L.: Traitement des infections chirurgicales, Compt. rend. Soc. de biol. **92**:485, 1925. Larkum, Newton W.: Bacteriophage in the Treatment of Furunculosis, J. Michigan M. Soc. **27**:106 (Feb.) 1928. Alderson, Harry E.: The Bacteriophage in Pyogenic Infections of the Skin, Arch. Dermat. & Syph. **21**:197 (Feb.) 1928. Rice, Thurman B.: Bacteriophage in Suppurative Conditions, J. Indiana M. A. **21**:509 (Dec.) 1928. McKinley, Earl B.: The Bacteriophage in the Treatment of Infections, Arch. Int. Med. **32**:899 (Dec.) 1923. Larkum, N. W.: Bacteriophage Treatment of Staphylococcic Infections, J. Infect. Dis. **45**:34 (July) 1928. Crutchfield, E. D., and Stout, B. F.: Treatment of Staphylococcic Infections of the Skin by the Bacteriophage, Arch. Dermat. & Syph. **22**:1010 (Dec.) 1930. Walker, J. E.: Action of Bacteriophage and Chemical Disinfectants on Staphylococcus in Subcutaneous Injections, J. Infect. Dis. **46**:324 (April) 1930.

claiming good results with phage not obtainable otherwise. In these cases application was by contact on the skin, introduction into superficial lesions or areas adjacent to them, remote subcutaneous injections, direct introduction into draining wounds and, in urinary infection, by catheter. There have been no previous instances in which bacteriophage has been introduced into the circulating channels of the human body. Indeed, Carter [31] could offer no data on the intraspinal use of bacteriophage, and, with regard to possible intravenous use, he cautioned against the liability to a foreign protein reaction because of the peptone present in the broth in which the bacteriophage is grown.

The particular preparation of staphylococcus bacteriophage used in the case reported is, according to Carter, valent against every strain of Staphylococcus aureus so far tested. Of the eighty-five strains on which the phage has so far been used, some showed greater resistance than others, but lysis could always be effected by increasing the minute amount of added phage, when necessary.

Briefly, the method of preparation consists of growing the various strains of Staphylococcus aureus in bouillon at 37 C. for four hours. Then, to these turbid flasks containing actively growing young organisms, seed phage is added in small doses. These cultures are incubated overnight, and on the following day they are quite clear, while control growths are exceedingly turbid. Tests are made at frequent intervals to insure the purity and identity of the growing organisms. The lysed culture is passed through Berkefeld filters and is checked by the regular sterility method prescribed for the control of biologic products. Each lot of the commercial bacteriophage, made by mixing the filtrate from all of the flasks, is then checked by an elaborate system of titrations to indicate the lytic power of the bacteriophage in high dilutions.

COMMENT

Of greatest interest is the fact that the spinal fluid cultures, taken at least once daily, were consistently positive for Staphylococcus aureus up to the giving of the first intraspinal injection of bacteriophage, and were thereafter sterile. The exacerbations of temperature and pulse rate and the toxemia following the initial treatment may, then, have been of the nature of a Herxheimer reaction.

When one considers the rapidity with which marked symptoms of meningitis came on within a few hours prior to the patient's admission to the hospital, it is likely that the spinal drainages, per se, arrested somewhat the course of the inflammation during the patient's first four days in the hospital.

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31. Carter, Edgar B.: Personal communication to the author. (Mr. Carter is director of the Biological Laboratories, Abbott Laboratories.)

This procedure, according to Griffith,[1] is used to delay dissolution in septic meningitis. That the antimeningococcic serum, provisionally employed, was therapeutically inert is demonstrated by such facts as the failure to reduce bacterial growth and white cell proliferation—nor was anything else to be expected in view of the nature of the causative organism, as later established. The patient's condition showed no favorable progress until the bacteriophage was given, whereupon, following the subsidence of the initial reaction, a steady subsidence of the inflammatory signs and symptoms (including the cell counts) promptly began.

No guides as to the size, frequency or number of doses of phage were available, and, faced with the hopeless prognosis of staphylococcus meningitis of this type and encouraged by many reports as to the efficacy of phage and its harmlessness to body tissues in other inflammations of similar etiology, it was hoped that with its introduction into the extremely sluggish circulation within the affected cerebrospinal spaces, sufficient direct contact could be made between the specific bacteriophage and the staphylococci to bring about lysis of the latter.

I am rather inclined to believe that less of the phage than the 10 or 15 cc. given twice daily would have done as well and probably would have effected a cure even if the administration had been over a much shorter period of time. Certainly, the immediate development of sterile spinal fluid after the first injection points that way. The guides were the spinal cell counts and temperature. Possibly, however, by extending the treatment I needlessly risked the development of an antibacteriophage or a bacteriophage-resistant strain of staphylococci.

Staphylococcus aureus meningitis, while by no means rare, is of such decidedly infrequent occurrence and ordinarily of such fatal significance that I feel justified in reporting this single case rather than accumulating a series.

SUMMARY

1. A review of the literature of staphylococcic meningitis is given, a classification of clinical types offered and a résumé of therapeutic measures and their efficacy made.

2. The literature of bacteriophage, to date, is covered, and evidence of the applicability of this agent to other staphylococcic infections is quoted.

3. A report on the first instance of the introduction of bacteriophage into the spinal canal is given, with comment on the resultant recovery in a true case of Staphylococcus aureus meningitis.

Medical Arts Building.

Progress in Pediatrics

RIGHT AORTIC ARCH

I. CLINICAL REPORT OF A CASE WITH ASSOCIATED ANOMALIES

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To find the human aorta arching over the right bronchus, as is normal in birds, has attracted the interest of anatomists for two centuries. Most of the cases on record have been discovered incidentally in the dissecting hall. Since roentgenologic studies in the past fifteen years have made the diagnosis of this condition possible in life, it has become of more than academic interest. It is one cardiovascular anomaly that can be recognized with certainty during life; yet, so far as we have been able to learn, no case so recognized has been reported in English up to the present.

DEVELOPMENT

It is well to begin with a brief review of the embryologic processes through which the definitive aorta is formed from the primordial vascular network of the branchial arches. The steps in this development have been beautifully illustrated by Congdon.[1] In the 13 mm. stage (fig. 1, *E*), the ascending aorta is continued through the right and left fourth arches into the paired dorsal aortas. These have blended distally to form the definitive descending aorta. The right pulmonic arch has disappeared, and the left is now the ductus arteriosus. With the descent of the heart, the subclavian arteries have ascended their respective dorsal aortas cephalad to their blending. In further development (fig. 1, *F*), the right fourth arch persists as the first part of the subclavian. The segment of the right dorsal aorta between the sub-

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Presented before the Atlanta Clinical Society, Oct. 28, 1931, and before the Fulton County Medical Society, June 2, 1932.

1. Congdon, E. D.: Transformation of the Aortic-Arch System During the Development of the Human Embryo, Contrib. Embryol. no. 14, Carnegie Inst., Washington, 1922, p. 47.

clavian and the point of fusion of the primitive paired aortas atrophies. The presence of both aortic arches in the adult is, then, essentially an arrest of the normal vascular development at the 13 mm. stage. These arches encircle the trachea and, usually, the esophagus. They may be equal in size, or one, more often the right, may be larger than the other.

The physical factors concerned in the persistence of both arches are incomprehensible to us. However, obliteration (with or without complete disappearance) of the left fourth arch or of the unblended segment

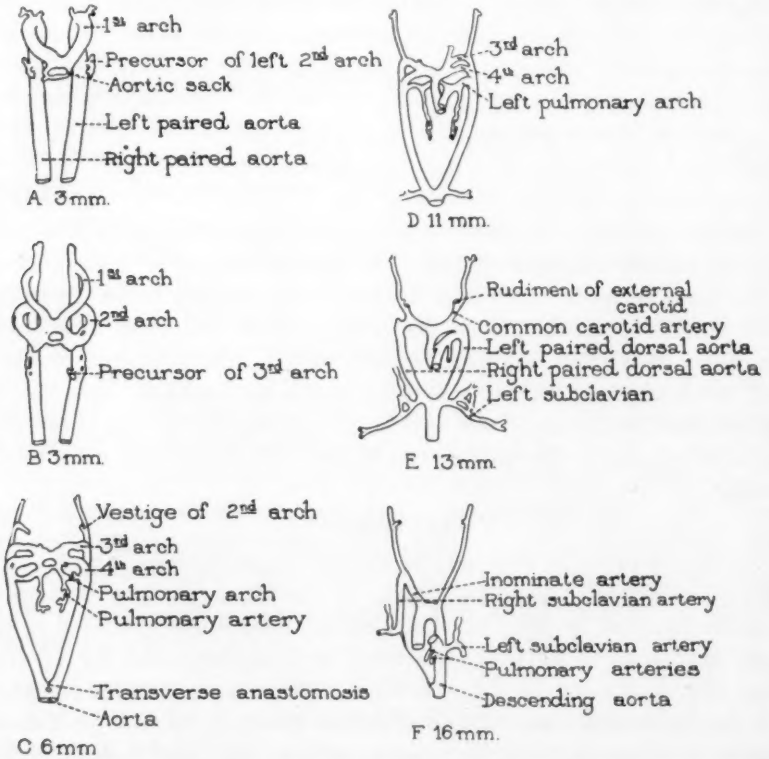

Fig. 1.—The development of the aortic arch, drawn from reconstructions. (After Congdon, from Blackford: Arch. Int. Med. **41**:702 [May] 1928.)

of the left dorsal aorta before the atrophy of the right dorsal aorta must result in the continued patency of the right dorsal aorta. That is, the right aortic arch results from the obliteration of the left arch because the blood stream continues to force its way through. Congdon studied in great detail the physical forces involved in the normal embryology of the aorta. If the left subclavian has ascended before the obliteration of the left aorta, the left fourth arch may be transformed into the first part of the left subclavian, as the right fourth arch is normally. Theoretically at least, the left common carotid and the left subclavian

might arise independently from the ascending aorta, as has been reported occasionally on the right.

Except in cases of mirror-transposition of the heart, the right pulmonic arch almost always disappears before the 13 mm. stage, leaving the left pulmonic arch to serve as the ductus arteriosus. It would appear that this is due to the direction of the blood stream from the right ventricle. When the left fourth arch persists only in the first part of the subclavian, the ductus opens into the distal end of this arch, that is, into the definitive subclavian. This junction is in front of the trachea and esophagus. In the most common form of right aortic arch, however, the left fourth arch has disappeared before the ascent of the left subclavian. Similarly, when the aortic arch courses normally, not infrequently there is obliteration of the right fourth arch before the ascent of the subclavian, so that this artery arises from the descending aorta. Many examples of this anomaly have been assembled by Goldbloom.[2] When such obliteration occurs on the left, the subclavian springs from a retro-esophageal aortic diverticulum at the beginning of the descending aorta. This diverticulum, which points forward and to the left, represents the segment of the left dorsal aorta that has not blended with its fellow on the right. In such cases, the ductus arteriosus, or its vestige, is attached either to the diverticulum or to the left subclavian. In this way a ring is formed around the trachea and esophagus. In the case with necropsy reported by Arkin,[3] the ligamentum arteriosum connected the left pulmonary artery with the aortic diverticulum, and a stout cord also connected the left subclavian, which sprang from a left innominate artery, and the diverticulum. Obviously in this case, the distal part of the left fourth arch, which had never been functionally adequate, was completely obliterated late in fetal life, or perhaps even after birth. In some cases in infants, the left fourth arch has disappeared, the ductus arteriosus being continued as the left dorsal aorta, and thus the left subclavian seems to arise from the ductus. Patency of the ductus is not uncommon in the reports of right aortic arch, but usually the subject was so young that this patency might be considered approximately physiologic.

A great deal of space has been devoted to the course of the recurrent laryngeal nerves. The descent of the heart causes the caudad branchial arches to pull down these nerves with them. Normally, the disappearance of the right pulmonic arch and the direction upward of the innominate artery cause the right recurrent laryngeal nerve to loop under the right subclavian. Since the left pulmonic arch points upward and

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2. Goldbloom, A. A.: The Anomalous Right Subclavian Artery and Its Possible Clinical Significance, Surg., Gynec. & Obst. **34**:378, 1922.

3. Arkin, Aaron: Total Persistenz des rechten Aortenbogen im Röntgenbild, Wien. Arch. f. inn. Med. **12**:385, 1926.

slightly outward, the left recurrent laryngeal nerve is under the left fourth arch, that is, under the definitive arch of the aorta. Alteration in vascular development causes corresponding alteration in the course of these nerves.

Congdon and Wang,[4] on the basis of comparative embryologic studies, offered elaborate mechanistic hypotheses to explain why the definitive aortic arch is on the right in the chick, but on the left in the pig. Granting that these hypotheses apply to human beings, the first and fundamental cause that diverts the bias of the embryologic processes in a primate to the avian type is yet unexplained. The early processes in the formation of the cardiovascular system are indeed so delicately adjusted that it is remarkable that they so seldom go wrong. But when they do go wrong in one detail, they often do so in more than one. According to White,[5] with whom we heartily agree, the basic cause of cardiovascular anomalies is still obscure.

It is true that the aortic arch is on the right in cases of general transposition of the viscera, as well as in some of those much rarer ones in which the heart alone presents a mirror-picture of itself. The embryologic processes that result in transposition of the heart and great vessels are entirely different from those under consideration at this time. Therefore, we believe that the term, "right aortic arch," may well be reserved for cases in which the aorta arises from the normally placed heart and arches over the right main bronchus.

REVIEW OF CASES OF RIGHT AORTIC ARCH WITH NECROPSY

In their review of this subject in 1930, Sprong and Cutler[6] saw fit to include cases of double aortic arch, even though in five the left (or anterior) arch had been obliterated. They assembled fifteen cases.[7] Roschdestwenskij[8] gathered from the literature eleven others.[9] Schleus-

4. Congdon, E. D., and Wang, H. W.: The Mechanical Processes in the Formation of the Differing Types of Aortic Arches of the Chick and the Pig in the Divergent Early Development of Their Pulmonary Arches, Am. J. Anat. **37**: 499, 1926.

5. White, P. D.: Heart Disease, New York, The Macmillan Company, 1931, p. 305.

6. Sprong, D. H., Jr., and Cutler, N. L.: A Case of Human Right Aorta, Anat. Rec. **45**:365 (March 25) 1930.

7. The cases of Arkin, Brigham, Buschendorff, Curnow, Dittrich, Ewald, Hamdi, Heller, Hermann, Kajava, Neddersen, Shaw, Thomson, Turner and Watson.

8. Roschdestwenskij, K. G.: Der doppelte Aortenbogen, Anat. Anz. **68**:145 (Nov. 12) 1929.

9. The first case was reported by Hommel, in 1737; the other cases were those of Biumi, 1755; Malacarne, 1788; Bertin, Sagorskij, Siebold, Hyrtl, Cruveilhier, Leboucq, Klinz, and, probably, Tichomirow. Banchi (Arch. ital. di anat. e di embriol. **6**:389 [July 10] 1907) and Monteiro (Arq. de anat. **13**:245, 1929) have given lists similar with one exception: Banchi cited a case by Zagorsky in which,

sing,[10] Harris and Whitney,[11] Roschdestwenskij [8] and Lockhart [12] reported original cases. Blackford [13] described persistence of a small right dorsal aorta in a case of sharply localized atresia of the otherwise normal aorta at the insertion of the ligamentum arteriosum. This was the first case in which the right dorsal aorta persisted in the presence of coarctation of the aorta of the adult type. It was used as an important support for the argument that this type of coarctation developed before birth. Two years earlier, unknown to Blackford, Arkin [3] argued that obliteration of the left fourth arch, resulting in persistence of the right aortic arch, was closely related embryologically to coarctation of the aorta. It is interesting to note that Blackford unconsciously

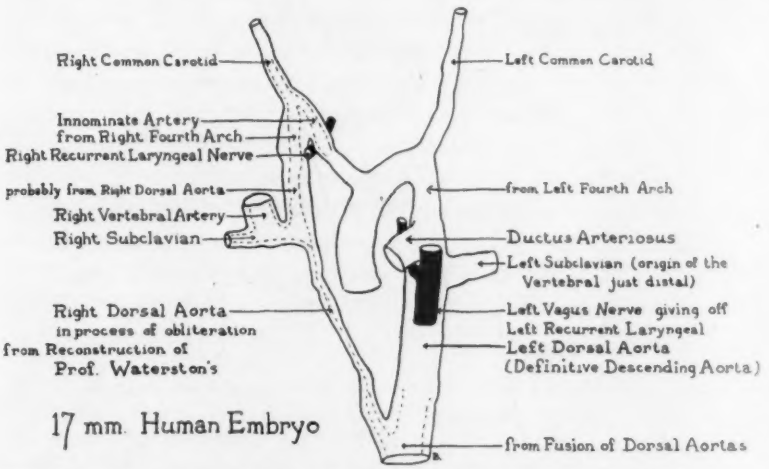
Right Common Carotid
Left Common Carotid
Innominate Artery
from Right Fourth Arch
Right Recurrent Laryngeal Nerve
probably from Right Dorsal Aorta
from Left Fourth Arch
Right Vertebral Artery
Right Subclavian
Ductus Arteriosus
Left Subclavian (origin of the Vertebral just distal)
Right Dorsal Aorta in process of obliteration from Reconstruction of Prof. Waterston's
Left Vagus Nerve giving off Left Recurrent Laryngeal
Left Dorsal Aorta (Definitive Descending Aorta)
17 mm. Human Embryo
from Fusion of Dorsal Aortas

Fig. 2.—The aortic arch at the 17 mm. stage, showing position of the recurrent laryngeal nerves. (After Gladstone, R. J., and Wakeley, C. P. G.: J. Anat. & Physiol. **45**:362, 1915.)

proved Arkin's point. The total number of cases of double aortic arch on record is therefore not less than thirty-one.

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as in that attributed by Roschdestwenskij to Sagorskij, the vascular ring contained only the trachea. It would seem that one attributed by Monteiro to Jagorsky was the same, and Sagorski is another probable variant. In addition, Banchi reproduced illustrations of the specimens reported by Hommel and Malacarne.

10. Schleussing, Hans: Beiträge zu den Missbildungen des Herzens, Virchows Arch. f. path. Anat. **254**:579, 1925.

11. Harris, H. A., and Whitney, C. E.: The Heart of a Child, Aged 19 Months, Presenting Right and Left Aortic Arches, with Multiple Anomalies of the Heart and Great Vessels, Anat. Rec. **34**:221, 1927.

12. Lockhart, R. D.: Complete Double Aortic Arch, J. Anat. **64**:189 (Jan.) 1930.

13. Blackford, L. M.: Coarctation of the Aorta, Arch. Int. Med. **41**:702 (May) 1928.

In spite of the fundamental embryologic difference between the two conditions already pointed out, we are glad to include double aortic arch in our consideration of right aortic arch because they cannot be distinguished clinically. Even the presence of dysphagia in cases of right aortic arch does not prove the existence of a vestige of the left arch. Abbott and Weiss [14] quoted at length the most interesting case of a puppy, which died of esophageal obstruction. The esophagus was caught in the ring formed by the right aortic arch and the ductus

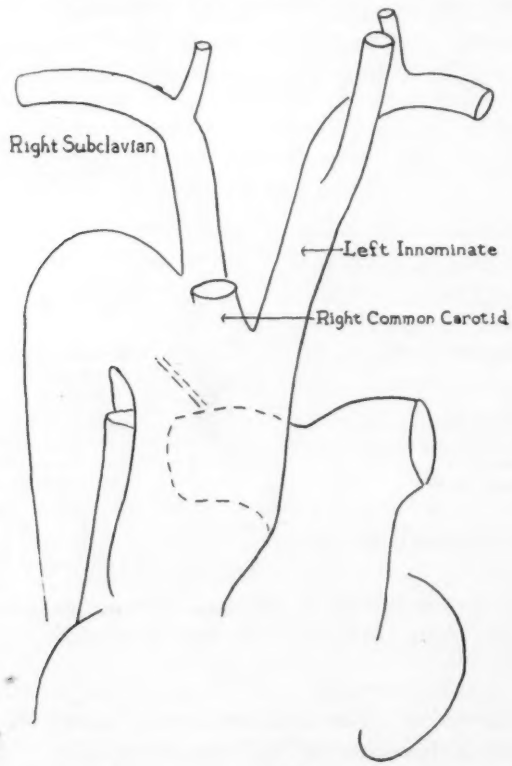

Fig. 3.—Diagram to illustrate the first type of right aortic arch. (After Reid: J. Anat. & Physiol. **48**:174 [Jan.] 1914.)

arteriosus. The contraction of the ductus in the stage of its obliteration resulted in strangling the esophagus. We do not know of a similar case in a human being, but eventually one may be reported.

Proceeding to cases of a single aortic arch on the right which have been found at necropsy, discussion may be simplified by observing the classification of Sprong and Cutler.[6] They divided such cases into

14. Abbott, M. E., and Weiss, Edward: The Diagnosis of Congenital Heart Disease. I. The "So-Called A-Cyanotic" Cases, in Blumer: Bedside Diagnosis, Philadelphia, W. B. Saunders Company, 1928, vol. 2, p. 360.

two groups according to the pattern of origin of the great vessels. In one group, there is a left innominate artery, a right common carotid and a right subclavian. Sprong and Cutler reported one example of this type and assembled thirteen others.[15] Additional cases have been illustrated by Abbott [16] and Reid [17] (case 2, fig. 3). In the latter case, for the first time on record, fibrous cords representing both primitive pulmonic arches were present. The total number of cases of right aortic arch with left innominate artery is accordingly not less than sixteen.

Sprong and Cutler defined another group in which the left common carotid, the right common carotid, the right subclavian and the left subclavian arise independently from the aorta. Of this type of case (figs. 4 and 5), they assembled twenty-six examples.[18] Sprong and Cutler stated that the left subclavian arose from a retro-esophageal diverticulum in seven cases. Probably on account of insufficient exact data, they were not specific about the origin of the left subclavian in the other cases, but they intimated that it was the last of the great vessels in all twenty-six cases. If our inference is correct, it is almost certain that the vascular pattern was uniform in the whole group. The left subclavian did arise from the retro-esophageal diverticulum in the cases of Versari,[19] Reid [17] (cases 1 and 3), Hoepke,[20] Stibbe,[21] Pense,[22] Jaffe [23] and Priesel.[24] Independent origin of the four great vessels in cases of right aortic arch has been reported, then, not less than thirty-four times.

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15. These cases were reported by Abernethy, 1793; Caillot, 1807; Obet, 1808; Bernard, Bosc, Bracht, Ewald, Ewen, Panas, Stokes, Turner, Valleix and Vincenzi.

16. Abbott, M. E.: Right Aortic Arch, in Osler and McCrae: Modern Medicine, ed. 3, Philadelphia, Lea & Febiger, 1927, vol. 4, p. 790.

17. Reid, D. G.: Three Examples of a Right Aortic Arch, J. Anat. & Physiol. **48**:174 (Jan.) 1914.

18. These cases were reported by Fioratti and Aglietti, 1763; Klinkosch, 1776; Meckel, 1809—this case also provided the famous intestinal diverticulum; F. C. Abbott, Dévé, Dickson and Fraser, Dittrich (two), Ewald, Gohn, Gottschau, Gruber, Hammer, Herringham, Hurley and Coates, Lockwood, Lockwood and Withers, Mutel and Fourche, Quain, Renander, Riche, and Turner. Several of these authors must have reported more than one case.

19. Versari, Riccardo: Rara anomalia dell'aorta e considerazioni sul tragitto tipico del nervo laryngeo inferiore destro nei casi di arco aortico a destra, Arch. ital. di otol. **4**:473, 1896.

20. Hoepke, Hermann: Ueber eine Varietät des Aortenbogens, Anat. Anz. **54**:60, 1921.

21. Stibbe, E. P.: True Congenital Diverticulum of the Trachea in a Subject Showing Also Right Aortic Arch, J. Anat. **64**:62 (Oct.) 1929.

22. Pense, Gertrud: Ein Fall von rechtsseitigem Aortenbogen und seine entwicklungsgeschichtliche Deutung, Anat. Anz. **70**:257 (Sept. 15) 1930.

23. Jaffe, Karl: Ein Fall von Missbildung des Herzens und der Gefässe, Inaug.-Diss., Leipzig, Münich, J. F. Bergmann, 1921.

24. Priesel, quoted by Arkin (footnote 3).

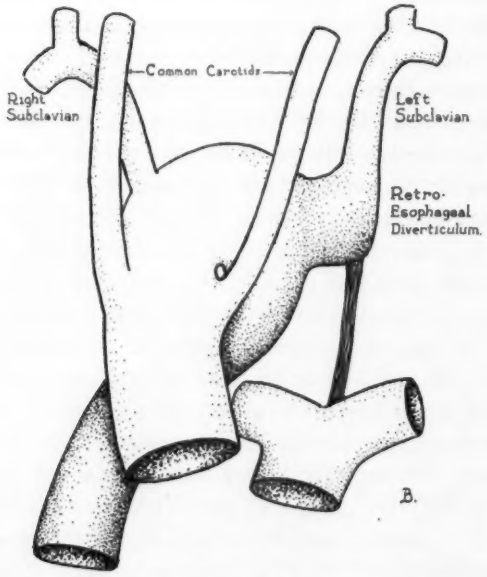

Fig. 4.—An example of the second type, viewed from in front. (After Stibbe: J. Anat. **64**:62 [Oct.] 1929.)

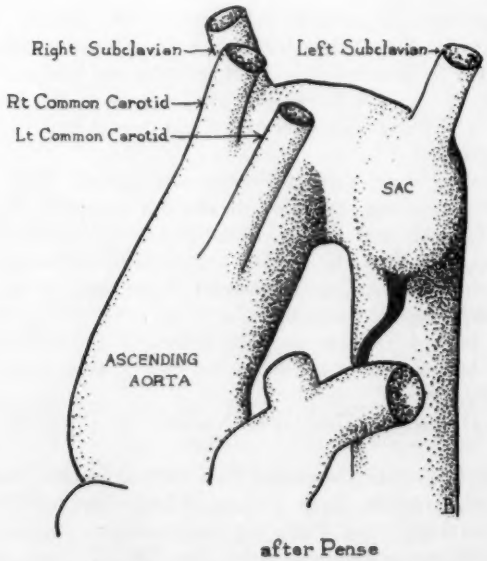

Fig. 5.—An example of the second type viewed from the left. (After Pense: Anat. Anz. **70**:257 [Sept. 15] 1930.) The trachea and esophagus rested in the notch between the ascending aorta and the retro-esophageal diverticulum (*SAC*).

Further classification of cases of right aortic arch is difficult. Annan [25] observed both common carotid arteries beginning in a single trunk from the aorta (normal in cetaceans); he quoted a "precisely similar case" by Garnier and Villemin, and Monteiro [26] another by Ancel. Banchi [27] illustrated one of this group reported by Cerutti in 1812. Monteiro also noted that in one of univitelline twins the order was left common carotid, right common carotid and a trunk that gave off the internal mammaries, the scapulars, the inferior thyroids and the right subclavian; the left subclavian arose from the descending aorta. He found a like case by Greig. In Monteiro's other twin, the arrangement was the same except that the left subclavian sprang from the ductus arteriosus. Löweneck [28] reported a case that is hard to explain embryologically: the aorta, as normally, gave off the innominate artery on the right and the left common carotid; it then arched over the right main bronchus and gave rise to the left subclavian behind the esophagus. In 1909, Weiss-Eder [29] demonstrated a specimen in which the foramen ovale and ductus arteriosus were patent. Assmann [30] abstracted two cases without giving the origin of the great vessels, and Saupe [31] was indefinite. Wheeler and Abbott,[32] Blackhall-Morison [33] and Walz-Stuttgart [34] described cases of incomplete double aortic arch with atresia of the pulmonic orifice and other grave anomalies. No data on the case of Smirnow [35] are available to us. Several authors have

25. Annan, J. L.: Case of an Abnormal Sinuous Aorta, J. Anat. & Physiol. **44**:241 (April) 1910.

26. Monteiro, Hernani: Crossa aórtica, à direita em dois fetos gémeos (univitelinos), Arq. de anat. **13**:245, 1929.

27. Banchi, Arturo: Il v arco aortico-branchiale nella interpretazione di alcune varietà dell' arco dell'aorta e dei suoi rami, con osservazioni originali, Arch. ital. di anat. e di embriol. **6**:389 (July 10) 1907.

28. Löweneck, M.: Einige seltene Beobachtungen aus der Oesophagus-Pathologie, Fortschr. a. d. Geb. d. Röntgenstrahlen **35**:1230, 1926.

29. Weiss-Eder, quoted by Pense (footnote 22).

30. Assmann, Herbert: Die hohe Rechtslage der Aorta, Klinische Röntgendiagnostik der inneren Erkrankungen, ed. 3, Leipzig, F. C. W. Vogel, 1924, p. 103.

31. Saupe, Erich: Ueber Dysphagia lusoria, Fortschr. a. d. Geb. d. Röntgenstrahlen **33**:740, 1925.

32. Wheeler, Digby; and Abbott, M. E.: Double Aortic Arch. and Pulmonary Atresia, with Pulmonic Circulation Maintained Through a Persistent Left Aortic Root, in a Man, Aged 29, Canad. M. A. J. **19**:297 (Sept.) 1928.

33. Blackhall-Morison, Alexander: Cardiac Malformation with Vascular Anomalies, J. Anat. **62**:227 (Jan.) 1928.

34. Walz-Stuttgart: Ueber einen seltenen Fall von Herzmissbildung (Kommunikation zwischen Aorta und pulmonalis, Uebergang der offenen Ductus botalli in die Subclavia, Dextropositio des Aortenbogens usw. bei Pulmonalatresie), Verhandl. d. deutsch. path. Gesellsch. **20**:232, 1925.

35. Smirnow, cited by Pense (footnote 22).

referred to a case of right aortic arch reported by Isidore Geoffrey St. Hilaire, in 1837, but we have not been able to find it catalogued.

In the group with double aortic arch, a patent ductus arteriosus was present in Hermann's [36] case (an adult). In the case of Harris and Whitney, the aorta arose from the right ventricle, and the interventricular septum was incomplete. Reference has been made to three cases with incomplete double arch in which there were serious associated defects.

Even complete data on all the sixty-six cases of right aortic arch mentioned would not permit statistics to be of value as regards association of other anomalies with the various vascular patterns. In Turner's case, a single atrium and a single ventricle were reported. The most common abnormality was defect of the interventricular septum. This was present in the cases of Meckel, Dickson and Fraser, Caillot, Obet, Bracht, and Assmann (two). In Assmann's case (as well as in that of Blackhall-Morison), the aorta was placed above the septal defect so as to receive blood from both ventricles. A defect of the interventricular septum was recorded in the cases of Schleussing, Jaffe and Weiss-Eder. In fifteen reports studied by us it was expressly stated that there was no anomaly of the heart. It is not likely that there was failure in any case to report a cardiac anomaly of importance.

SEMEIOLOGY

As already remarked, doubling or dextroposition of the aortic arch has been most often found in the dissecting hall, and thus no history has been available. Even so, symptoms seem to be unusual. Death was due to esophageal obstruction in the case of Herringham; [37] dysphagia had been present in the case of Hermann [36] and, for a short time, in that of Saupe.[31] In Saupe's case, death was from pulmonary tuberculosis at 60, and it was thought that the dysphagia was due to dilatation of the retro-esophageal arch of the aorta secondary to hypertension and arteriosclerosis. Several deaths in infancy were probably from other grave defects. Many bearers of right aortic arch have attained their normal life expectancy, or have exceeded it. Curnow's case of double aortic arch was found in a woman of 87, and Pense's right arch in a sailor of 78. Some of these persons, it is true, have died of hypertensive disease, arteriosclerosis or syphilitic aortitis. But death from these causes in persons beyond the prime of life cannot logically be associated with a developmental anomaly. Certainly, then, uncomplicated double or right aortic arch does not necessarily shorten life.

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36. Hermann, W. W.: Double Aortic Arch, Arch. Path. **6**:418 (Sept.) 1928.
37. Herringham, quoted by Sprong and Cutler (footnote 6).

DIAGNOSIS

Assmann,[30] in collaboration with Mohr and Albracht, of Leipzig, was the first to make the diagnosis of right aortic arch during life. This was in 1918. By 1924, these men had made the diagnosis and seen it verified post mortem three times. Necropsy in one of these cases was reported in detail by Jaffe.[23] In all three the presence of associated cardiac anomalies had led to a careful roentgenologic study of the patients and, through this means, to the diagnosis. In 1922, Herrnheiser [38] reported briefly the clinical case of a girl of 14, in which the diagnosis of right aortic arch, with pulmonic stenosis and, probably, the aorta over-riding a septal defect, was made. In the same year, Frank (we could not find this reference), according to Herzog and Firnbacher,[39] reported another case with septal defect. In 1925, while investigating the esophagus fluoroscopically in a case of dysphagia, Saupe [31] realized that the displacement of the esophagus to the left at the level of the arch was caused by a right aortic arch. In reviewing his routine roentgenograms of the chest, he was able to make the same diagnosis in an earlier case in which necropsy was not done. Perhaps the most complete paper on the roentgenologic diagnosis of right aortic arch is that by Arkin,[3] in 1926. After making the diagnosis in one case according to Assmann's criteria, he made further investigations by purposefully visualizing the esophagus in that and in two additional cases. In the first of these death was not related to the cardiovascular anomaly and the heart was normal; in the other two, there were neither symptoms nor signs of cardiac abnormality. In 1927, Herzog and Firnbacher [39] presented five views of the visualized esophagus of a healthy farmer, aged 67, to establish the right-sided position of his arch; this aorta was singularly tortuous. In 1926, Grossmann and Meller [40] reported a right aortic arch with subdiaphragmatic transposition of the viscera; the patient had had nine children, but she had never had evidence of heart trouble. Some of these authors, from a review of the cases diagnosed in life, expressed the opinion that right aortic arch was commonly associated with other cardiovascular anomalies. Actually, however, of the twelve cases that we know were diagnosed in life, but five presented evidence of such anomalies. Indeed, this proportion of associated anomalies is many times greater than in the larger

38. Herrnheiser: Pulmonalstenose mit hoher Rechtslage der Aorta, Fortschr. a. d. Geb. d. Röntgenstrahlen **29**:519, 1922.

39. Herzog, F., and Firnbacher, E.: Beitrag zu den Anomalien der Aorta und des Oesophagus, Fortschr. a. d. Ges. d. Röntgenstrahlen **35**:1236 (April) 1927.

40. Grossmann, J., and Meller, Oskar: Hohe Rechtslage der Aorta bei normal gelagertem Herzen in einem Fall von Situs viscerum inversus subdiaphragmaticus, Fortschr. a. d. Geb. d. Röntgenstrahlen **33**:1120, 1928.

series found at necropsy. The explanation evidently is that the presence of other more grave lesions led to a careful roentgenologic study in this series.

As Assmann demonstrated, in cases of right aortic arch, fluoroscopic examination reveals that the pulsating aortic knob is on the right and higher than normal. In the diagonal views, the arch is seen over the right main bronchus instead of over the left. These signs are absolute. In most cases careful study of the usual anteroposterior plate is sufficient at least to arouse suspicion. The simplest way to confirm this suspicion is to watch the patient swallow barium sulphate under the fluoroscope. Probably most cases will be diagnosed by seeing the stream of barium in the esophagus diverted sharply to the left at the level of the aortic arch.

In the first oblique diameter of the first case, Arkin noted in the shadow of the aortic arch, just above and behind the origin of the right main bronchus, a deeper, rounded shadow. This he interpreted as the root of the left dorsal aorta and was able to obtain confirmation at necropsy. The same sign was present in the other two. Arkin also noted in all three of his cases, that the second sound was louder in the first right interspace just to the left of the sternum than in the second interspace. He believed that this was a matter of diagnostic significance.

Perhaps the principal clinical importance in making the diagnosis of right aortic arch is to distinguish it from aneurysm of the arch of the aorta or of the innominate artery. The diagnosis, although it can be made during life only by roentgenologic methods, can be made with certainty.

REPORT OF CASE

History.—The boy has been under the observation and care of one of us (Dr. Davenport) since early infancy. He was born in 1921. His mother suffered from nausea and nervousness during the period of this pregnancy, but had no infectious disease; nausea recurred during her second pregnancy. Delivery of the patient was normal, but he had been pronounced a "blue baby," and rapid respiration was noted during the early months of life. The presence of a cardiac anomaly was recognized almost at birth. The initial cyanosis subsided somewhat, but it became more pronounced at 8 months when he began to sit up. During his second year he went through a siege of whooping cough, with exacerbations of the cyanosis until he appeared black. Subsequently, he passed through measles, mumps, bilateral otitis media and frequent "colds." Epistaxis occurred occasionally. On Oct. 10, 1930, the child was said to have fainted while at school, and his playmates assisted him home. For the next two hours, although conscious, he had been apparently unable to utter a sound. Speech returned suddenly and completely. The following day, without exciting cause, the aphonia recurred for a quarter of an hour. He was admitted to the Henrietta Egleston Hospital for Children for study.

Examination.—The boy was 52 inches tall (132 cm.) and weighed 56 pounds (25.4 Kg.). Clubbing was marked and cyanosis moderate. The retinal veins were

rather full and darker than normal, and the outlines of the optic disks somewhat blurred. Many teeth were carious, and the tonsils were enlarged and injected. No thrills were palpable over the heart. Dulness extended 2 cm. to the right of the midline in the second and third interspaces and 6 and 7.5 cm. to the left in the fourth and fifth interspaces. The heart sounds at the apex were normal, and continued so up to the level of the third rib. The second sound was slightly accentuated in the second right interspace; over this area, a long, soft, blowing murmur was heard, which was transmitted infraclavicularly to each side and to the right interscapular space. This murmur began immediately after the second sound, increased with systole, and faded away just before the second sound recurred. It was best heard when the patient was not breathing. Posteriorly, the murmur was

Fig. 6.—Anteroposterior teleoroentgenogram. The left border of the ascending aorta is distinct in the reproduction. The aortic knob is indicated on the right, and arrows point out a slight prominence on the left; this is thought to be the retroesophageal diverticulum of the aorta.

distinctly louder than in front. In the right arm the systolic blood pressure was 92, the diastolic 64; in the left arm the readings were 84 and 60, respectively. At another examination, systolic pressure was 70, but the diastolic could not be determined. The examination otherwise was without interest. During the two weeks of observation in the hospital, his pulse ranged usually from 80 to 100.

We examined the boy again on May 8, 1931. Pulsation was visible and palpable, lateral to the clavicular insertion of the sternocleidomastoid muscle and in the first and second interspaces just to the right of the sternum, greater in the second. The second sound was again more pronounced in the second interspace than in the first. The murmur seemed to be the so-called "machinery murmur," and was also

loudest in the second right interspace. This murmur was even louder in systole in the right interscapular space at the level of the fourth dorsal vertebra and was transmitted directly downward. The red cells numbered 6,542,000, and the hemoglobin was 17.5 Gm. per hundred cubic centimeters of blood (Newcomer disk). Fluoroscopically, pulsation of the aortic knob was visible to the right of the sternum, and there was some pulsation in the region of the conus arteriosus. Pulsation of the pulmonary arteries at the hili was not observed. In the teleoroentgenogram (fig. 6), slight enlargement of the left ventricle and increased width of the ascending aorta, which was largely to the right of the midline, were noted. In addition to the knob on the right, the aorta showed a slight bulge to the left at the same level. When an anteroposterior plate was made with the esophagus visualized

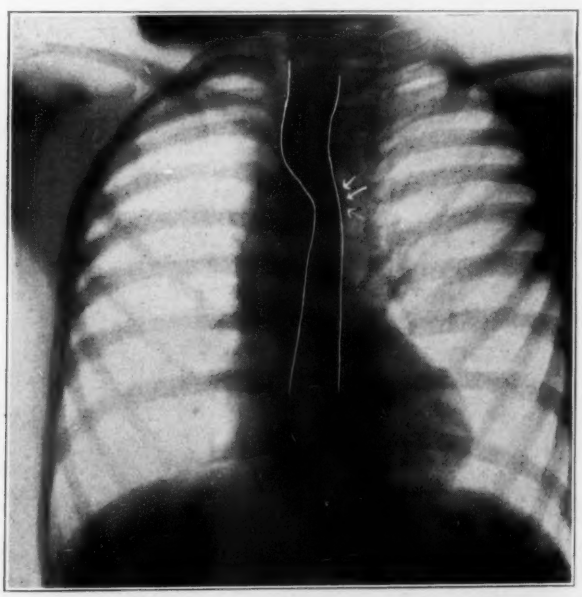

Fig. 7.—Roentgenogram taken at 40 inches. The outline of the esophagus, which had been visualized with barium sulphate, has been traced over. A shadow believed to be the edge of the retro-esophageal aortic sac is indicated with arrows.

(fig. 7), this bulge to the left could be made out beyond the esophagus. In the diagonal views the aorta was seen arching over the right bronchus.

Dr. Lila M. Bonner said that the electrocardiogram exhibited right ventricular preponderance, with marked notching of the Q R S complex and unusually high P and T waves in lead II.

Course.—The child has continued at school. He sleeps restlessly, continues to suck his thumb, and occasionally complains of paresthesia in the lower extremities. It seems that he can play about as hard as his associates, although playing increases the cyanosis until sometimes he looks almost black. It has been difficult to determine whether or not this boy has ever really lost consciousness. His grandfather reported that he had overheard the lad's playmates urging him to "throw a heart attack"; that he had obligingly done so from time to time, and had been carried to

a hospital followed by a crowd of excited and admiring small boys. His teacher said that occasionally he threatens to have a "heart-attack," but that she had observed that it is always when he is told to do something that he does not wish to do. The descriptions of these attacks are most suggestive of hysteria or malingering.

The child was examined again on Oct. 26, 1931. In the preceding year he had grown an inch, but had lost a pound. Systolic blood pressure in the right arm was 90, diastolic 60; in the left arm, 76 and 56, respectively. The examination otherwise was like the preceding ones.

Fig. 8.—Electrocardiogram (courtesy of Dr. Lila M. Bonner). The P-R interval (0.20 second) is at the upper limit of normal, suggesting abnormality in the conduction bundle, which in turn suggests abnormality of the interventricular septum. Right ventricular preponderance is marked.

COMMENT

The original diagnosis in this case was patency of the ductus arteriosus (Dr. Davenport). The prolonged murmur at the base, its soft, blowing, crescendo-diminuendo character and its infraclavicular and interscapular distribution all support this diagnosis. The child is slightly built and poorly developed, as is typical of this anomaly,

according to Abbott and Weiss.[14] But, as a rule, in cases of patent ductus arteriosus, there is "anemia, sometimes to the point of a wax-like pallor." Cyanosis and clubbing are usually entirely absent. "Where cyanosis exists it is usually slight or transient, appearing on exertion or during a dyspneic attack . . . or it may be terminal."[14] In this case, there has been marked, life-long cyanosis, with pronounced clubbing. In front the murmur was greater to the right of the midline, as in a case cited by Abbott and Weiss. But the murmur was much louder behind than in front, as well as much louder on the right of the vertebral column than on the left. In at least one case of patent ductus arteriosus, the systolic murmur was audible only in the left interscapular space. The original diagnosis in the present case, although almost surely

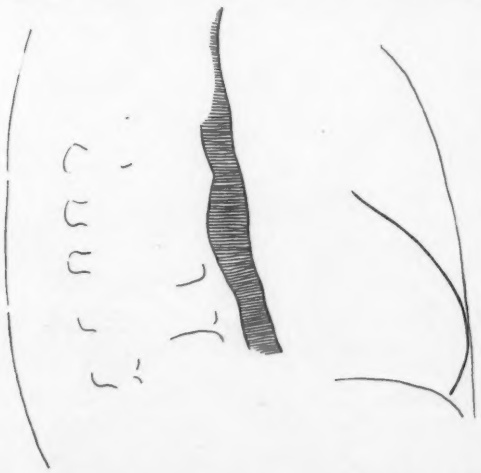

Fig. 9.—Tracing of roentgenogram taken at 40 inches in the first oblique diameter. Note that the esophagus, which has been visualized with barium sulphate, is pulled forward sharply at the level of the base of the heart, well below the aortic arch and the bifurcation of the trachea.

correct, was inadequate to explain the degree of cyanosis present, and we were therefore led to detailed roentgenologic studies.

In the usual anteroposterior teleoroentgenogram, the ascending aorta appeared greatly widened and rather to the right of the midline (fig. 6). Careful study revealed the aortic knob on the right with a bulge to the left at the same level. In the light of subsequent studies, this plate may be considered diagnostic. In the second anteroposterior view, the esophagus visualized with barium was seen sharply pushed to the left at the level of the arch (fig. 7). From this plate we made the diagnosis of right aortic arch, although at that time we were ignorant of the various papers that we have since read on the roentgenologic diagnosis of this condition. Again, close observation will reveal a projection to

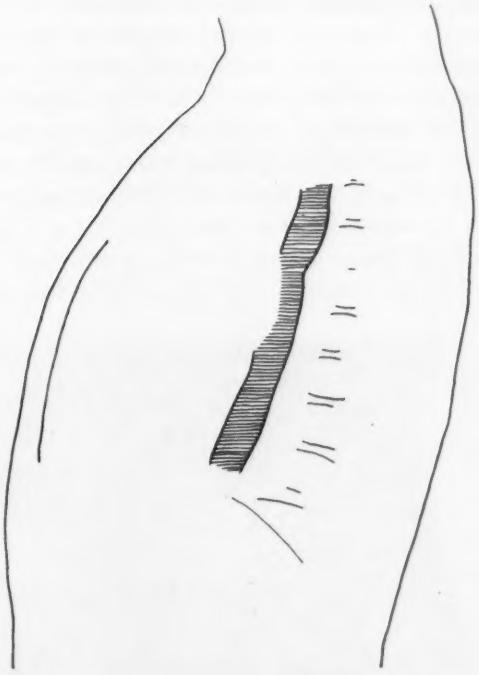

Fig. 10.—Tracing of roentgenogram taken at 40 inches, direct lateral diameter. Note that the esophagus is pulled forward at the same point as in figure 9.

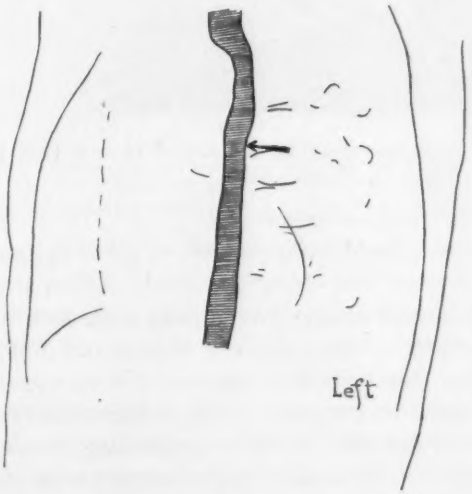

Fig. 11.—Tracing of roentgenogram taken at 40 inches in the second oblique diameter. The esophagus is pushed sharply to the left at the summit of the arch and appears to be pulled back toward the midline at the arrow.

the left of the esophagus that can only be interpreted as the diverticulum that represents the distal root of the left dorsal aorta. In the first oblique diameter (fig. 9), the visualized esophagus comes forward at a sharp angle well below the aortic arch. For a time we thought that the esophagus was here pushed forward by the descending aorta as it crossed behind the esophagus to descend further on the left. This made us unable to explain why the murmur which was so loud to the right of the vertebral column just below the spine of the scapular should be transmitted straight down. When we got a satisfactory view of the second oblique diameter (figs. 12 and 13), with the help of Dr. Edgar D.

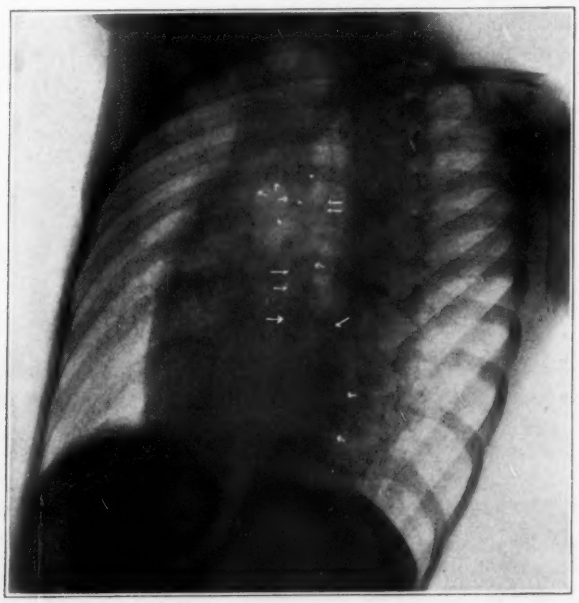

Fig. 12.—Teleoroentgenogram in the second oblique (left anterior) diameter (courtesy of Dr. Edgar D. Shanks).

Shanks, we were able to make out the descending aorta on the right of the spinal column well below this level. Since, however, the right pulmonic arch almost always has disappeared, and the left provides the ductus arteriosus even in cases of right aortic arch, we believe that it is the ductus that is pulling forward the esophagus in this case. This same appearance was also found in direct lateral views, and was constant. As the last step in the roentgenologic studies, we asked Dr. Shanks for plates of the first oblique diameter; with stereoscopic views we were able to discern the retro-esophageal diverticulum that Arkin emphasized. This was represented by an oval shadow lying in the

arch of the aorta just above the right bronchus, between the vertebral column and the trachea (fig. 14).

The exact origin of the left subclavian artery must remain a mystery during the life of this child. It may be from the ascending aorta, from a left innominate artery, from the ductus arteriosus, or it may be from the posterior root of the left dorsal aorta. We consider the last possibility the most probable one.

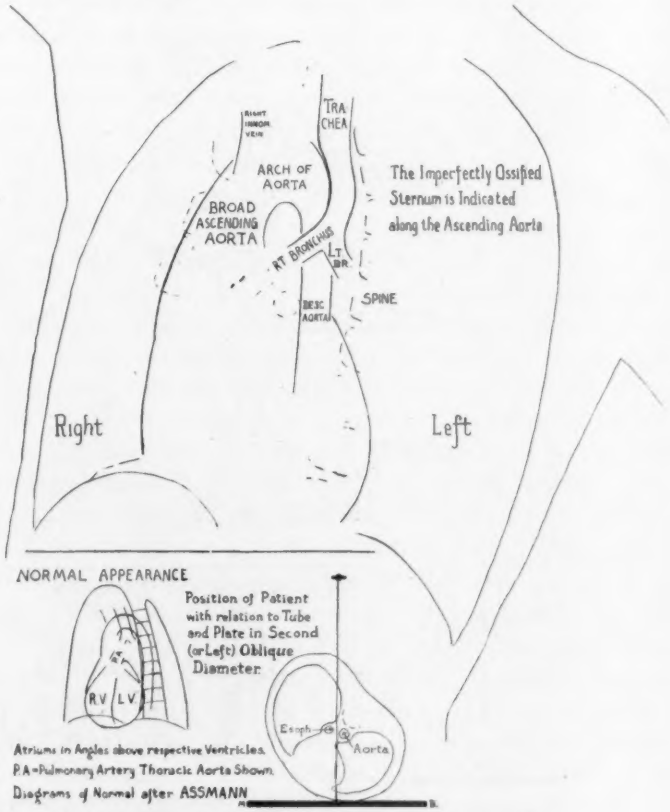

Fig. 13.—Tracing of the roentgenogram in figure 12.

In the second oblique view, not only is the position of the arch over the right bronchus evident, but the extreme width of the ascending aorta is plain. The outer border of the right ventricle and that of the ascending aorta form an almost unbroken line. These facts, coupled with the long-standing cyanosis, make us believe that the aorta receives blood from both ventricles; that is, that it over-rides a defect at the base of the interventricular septum. Such an origin of the aorta was present in two of Assmann's cases of right aortic arch. This biventricular origin is not a particularly uncommon anomaly. In

the majority of cases it is associated with pulmonary stenosis, and, of course, with hypertrophy of the right ventricle—the so-called tetralogy of Fallot. On phylogenetic grounds, Spitzer [41] argued that such an aorta represents the fusion of the primitive aorta from the right ventricle (normal in reptiles) with that from the left. For these and other reasons, we [42] suggested the term, "biventricular aorta," for this condi-

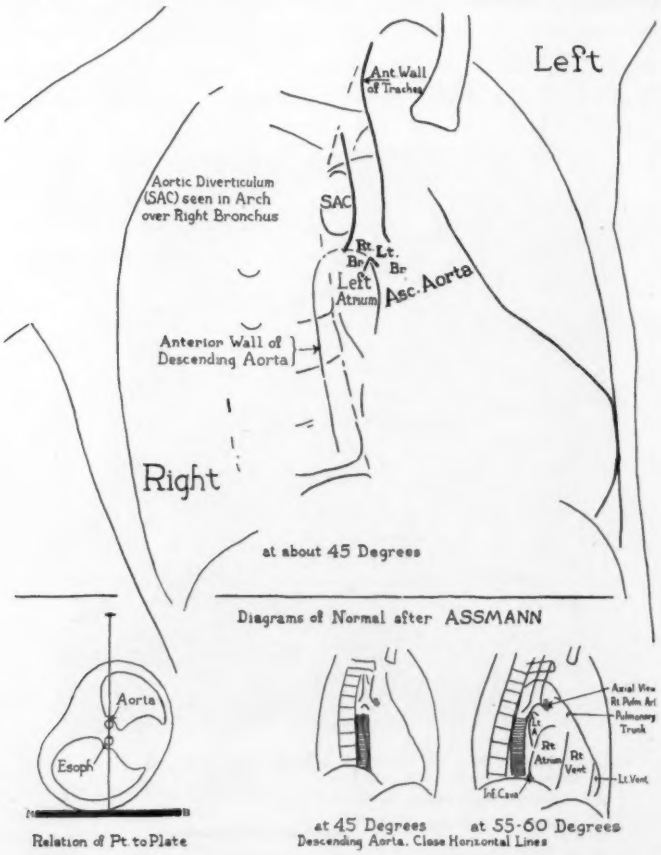

Fig. 14.—Tracing of teleoroentgenogram in the first oblique (right anterior) diameter, taken by Dr. Edgar D. Shanks. This tracing is presented chiefly to show the retro-esophageal diverticulum of the aorta, which could only be made out definitely by stereoscopic plates.

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41. Spitzer, Alexander: Ueber den Bauplan des normalen und missbildeten Herzens: Versuch einer phylogenetischer Theorie, Virchows Arch. f. path. Anat. **243**:81, 1923.

42. Blackford, L. M.; Ballenger, W. L.; Adkins, C. P.; Beall, C. R. F.; Cleveland, J. Q., and Anderson, W. W.: Congenital Heart Disease: Clinical Reports of Anomalies of the Aortic and of the Interventricular Septums, unpublished.

tion. The electrocardiographic report of right ventricular preponderance is corroboratory of the extra strain on this ventricle for, if our reasoning is correct, the pressure in the right ventricle must at least equal that in the left. It may be noted that, contrary to the observation of Arkin, in our case the second sound is louder in the second right interspace than in the first. This may be due in part to the youth of the patient. We believe, however, that it is more probably because the ascending aorta, since it originates partially from the right ventricle, is nearer the chest wall just above the aortic valve.

At any rate, cyanosis has always been marked in this child, and at times is extreme. As Abbott [43] said, stunting, both physical and mental, as well as attacks of syncope, are frequent in cases of cyanosis. The explanation lies probably in an insufficient supply of oxygen to the brain. We have noted these phenomena in the majority of a series of cyanotic patients.[42] But we do not know whether this boy has ever fainted, nor do we know how much of his personality is due to the way in which he has been brought up and how much to the cyanosis.

The prognosis in this case is difficult to determine. There is no reason to believe that the right aortic arch itself makes the outlook gloomy. But Abbott [43] showed with statistics that, in cases of marked cyanosis due to congenital heart disease, the prognosis is grave. If such patients survive the first year, in a few years they are likely to succumb to pulmonary tuberculosis or to subacute bacterial endocarditis. The most remarkable exception to this rule was reported by White and Sprague,[44] and elsewhere [42] we assembled several others. Our patient has already weathered the storm of several illnesses and seems able to play about as strenuously as his companions. This indicates that the functional capacity of his heart is good and that, under ideal conditions, he might attain his normal life expectancy. However, the child's parents are separated, and he is being brought up by his aged, indulgent grandfather, who allows him both to eat and to act entirely as he pleases. When the grandfather does attempt to assert himself, the child holds his breath until the cyanosis becomes even more marked, which always results in the desired effect. It has proved impossible, under these circumstances, to check the boy's activities, or even to see that he is properly fed. The Social Service Department of the Egleston Hospital arranged to place him in a better environment. The father agreed to

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43. Abbott, M. E.: The Diagnosis of Congenital Cardiac Disease: II. True "Morbus Caeruleus," in Blumer: Bedside Diagnosis, Philadelphia, W. B. Saunders Company, 1928, vol. 2, p. 430.

44. White, P. D., and Sprague, H. B.: The Tetralogy of Fallot: Report of a Case in a Noted Musician Who Lived to His Sixtieth Year, J. A. M. A. **92**:787 (March 9) 1929.

this plan, but the lad preferred to retain his freedom untrammeled. With conditions such as they are, there is nothing we can do except to hope that in due season we shall have the opportunity to add to our store of knowledge.

SUMMARY

Shortly after the 13 mm. stage, the left dorsal aorta or the left fourth aortic arch may be obliterated. If this occurs in a considerable segment before the atrophy of the distal part of the right dorsal aorta, the right dorsal aorta remains patent on account of the force of the blood stream. If the right aorta has disappeared and the atresia is sharply localized just distal to the mouth of the ductus arteriosus, coarctation of the aorta (adult type) results. For reasons that cannot be explained on either etiologic or physical grounds at this time, occasionally there is arrest of embryologic processes resulting in persistence of both aortic arches. There have been reported approximately a hundred cases of right aortic arch: some alone, some with an obliterated left arch and some with a patent left arch. If there is no associated lesion, such abnormal development is not likely to impair the health or longevity of its subject. It is possible to make an absolute diagnosis of right aortic arch in life, but it does not seem possible to exclude persistence of a vestige of the left arch.

A case is reported of right aortic arch in a boy 10 years of age at the time this article is written, who has been under our care since infancy. The aorta is unusually wide at its origin, probably because it receives blood from both ventricles. The aorta arches over the right main bronchus and descends for the greater part of its intrathoracic course on the right of the vertebral column. In addition, we believe that the ductus arteriosus is patent. On account of the cyanosis present and on account of unfavorable home conditions which we are powerless to alter, the prognosis in this case is dark.

NOTE.—Since this paper was completed, Dr. Mason I. Lowance and Dr. Homer Blincoe discovered a case of double aortic arch at Emory University.

384 Peachtree Street.
104 Ponce de Leon Avenue.

Pediatrics in Art

THE INFANT'S BINDER

JOHN RUHRÄH, M.D.
BALTIMORE

Portrait of Prince Federigo d'Urbino by Baroccio.

Federigo Baroccio (1528-1612), a popular painter of Urbino, among other things painted the portrait of the young prince Federigo d'Urbino. The child is on a bassinet which is evidently used only for show purposes, as there would be great danger of the child's rolling off. The cover and binder are richly ornamented and give a good idea of the expense lavished on princely infants, at least when shown to the public. The picture is in the Pitti Gallery in Florence. The photograph is by Alinari.

Pediatric Biographies

JULIUS ALEXANDRINUS
1506-1590

JOHN RUHRÄH, M.D.
BALTIMORE

Almost forgotten today, Jules Alexandrinus de Neustain was one of the celebrities of his day. He was born with a silver spoon in his mouth, as his father was Pierre Alexandrinus, secretary to the emperor and a lawyer of marked ability. Jules was educated at Padua where he studied first philosophy, mathematics and Greek, and then medicine. He bent his entire energies to his work and soon became celebrated for his cures and his learning. It is said that in 1566 Emperor Ferdinand II made him imperial archiater, and this position of honor and responsibility he held under Maximilian II and Rudolph II. Maximilian showered honors on him, confirmed his titles of nobility and permitted him to transmit his titles and the name of de Neustain to his sons, although they were not legitimate. There is some difference of opinion as to whether Alexandrinus retired on account of age, but he died at Trente, Aug. 25, 1590. Eloy stated that his epitaph was as follows:

> Caesaribus si quis multos enservit annos,
> Acceptua magnis Principibusque fuit.
> Te Juli, vatem possum medicumque fateri,
> Doctrina in cujus gratia tanta fuit.
>
> (If any one has served the Emperors
> For many years, and has been pleasing
> to great Rulers, I can acknowledge you,
> Jules, a poet and physician in whose
> learning there has been such great favor.)

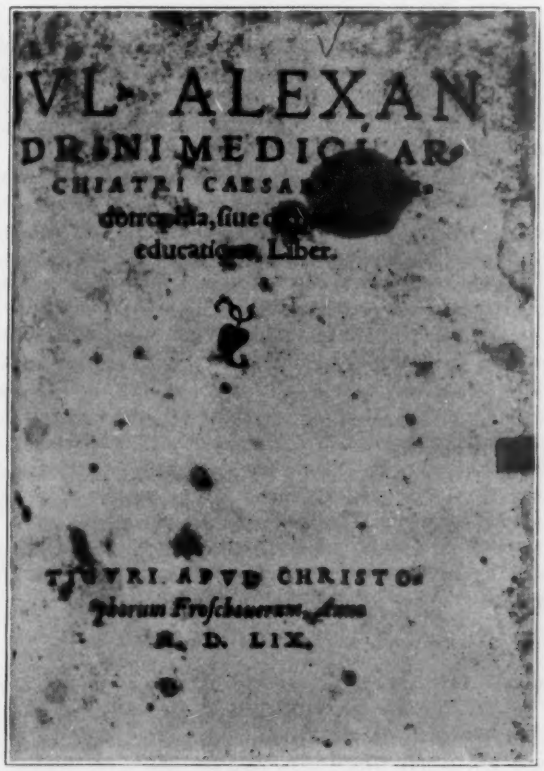
He left two sons, one of whom, André, also studied medicine.

He was highly esteemed by his contemporaries, and Matthiali placed him among the principal restorers of the art of medicine, which, of course, was not merited. He was a blind follower of Galen and defended the galenic ideas against all comers and especially against Jean Argenterio. He commented on Galen's works and made translations of some of them.

Eloy listed eleven works by him, only one of which is of interest, the poem "Paedotrophia," published in Tiguri in 1559. There is a copy in the Library of the Surgeon General at Washington. It is a little book of thirty-eight pages dedicated "to the most magnificent and generous

Lord Hieronymus, Baron in Sprinzenstain, consilario Caesareo." It is not without interest, and a small portion in the original will give some idea of the style:

> Vidi ego iam cui primi inter cunabula nati
> Tantum error spretique potest inscitia recti
> Quam tum ingens tenera instruera ad deforma lingua
> Cura erat, inque deos polluto paruulus ore,
> Et male moratam temerari libidine mentem,
> Verbaque cum factis miscere inhonesta prophanis.



Title page of the work of Alexandrinus.

The English rendition of this part and a short portion following it are given in the translation of Miss Ruth Gilroy:

The Rearing of Children

I saw one who was eager, even over the cradle of his first born (so great may be the delusion and ignorance of rectitude) to train the childish tongue to utter base abuse against all men, and the child with defiled lips toward the gods, polluted its evil mind with wantonness and mingled dishonorable words with profane deeds. Nor was there any cessation, until, without affection, he first began to terrify his

parents themselves with threatening words, and invoked all manner of evil upon the wretched ones. Soon he broke forth into every vice and crime and could have shed his father's blood with the cruel sword. Then when once debauchery had been made worse because of free reins, dice and the cunning arts of courtesans were hostilely brought into the home formerly sacred to the Muses and to Phoebus, and caused ruin and destruction everywhere. Since these same disgraces had been formerly introduced at the very commands of the father, he necessarily followed these same examples and thereupon approaches not formerly accessible to every fault lay open for all crimes.

But unless, with constant care, you shall change the faults and guide the young life, and, while it is possible, adapt the minds to every study and summon them into better paths, do not hope that in the future you can tear them away from the years—when it is too late—or blot out the disgraceful marks which error, once committed, has attached indelibly to the tenacious mind. For this reason, see that the child does not often spend his daytime in weeping and rend himself with long sobbing, whence a fierce and angry violence gradually seizes the conquered mind and a distemper disturbs deep sleep.

And yet the clear and only reason for weeping is not always seen, for often a tiny insect is concealed and with its fierce tooth and sharp sting pierces the limbs and crawls stealthily over the skin, pinching and biting the body with its foul mouth. Often the lack of cleanliness disturbs, and perspiration annoys the body. You will observe these and other things with great care, if the health of the child is not your least concern.

Not much later another suffering makes its attack—nor is it less severe—when the troublesome teeth in the swollen gums try to break through, and aggravate the mouth which is convulsed with pain. Do not hesitate to relieve them with bird dung and the soft brain of a hare. Then when the point protrudes and the tooth causes sharp pains as it comes forth, it compels the child to bite its fingers. Mix honey and rich milk together and daub the mouth with this mixture; likewise iris root which has just been cleaned is dried for this purpose.

And now some enclose coral in bright silver or yellow gold, an especially pleasing gift—the teeth of a wolf may be enclosed in the same material—and hang it around the child's neck. The child constantly bites on these and keeps its mouth in motion. By the constant rubbing the tooth comes out more quickly and the deeply fixed wall of teeth grows steadily.

Abstracts from Current Literature

Pathology, Bacteriology and Biochemistry

THE CONDITIONS GOVERNING THE REMOVAL OF PROTEIN DEPOSITED IN THE SUBCUTANEOUS TISSUES OF THE DOG. MADELEINE E. FIELD and CECIL K. DRINKER, Am. J. Physiol. **98**:66 (Aug.) 1931.

Under normal conditions protein that has left the blood vessels or that has been placed in the subcutaneous areas is unable to pass back through the capillary endothelium, but must return to the blood by the lymphatic route. After plasmapheresis, with substantial reduction of total blood protein, foreign protein placed in the subcutaneous tissues can be detected serologically in the blood when entrance by lymphatic routes has been blocked. Thus, under the experimental conditions, the capillary endothelium is permeable to protein in both directions.

NOURSE, Cleveland.

DOES HEMOPHILIC BLOOD CONTAIN AN EXCESS OF AN ANTICOAGULANT? P. S. EVANS, JR., and W. H. HOWELL, Am. J. Physiol. **98**:131 (Aug.) 1931.

The experiments reported showed no evidence of the presence of an excess amount of antiprothrombin in hemophilic blood. On the contrary, the figures indicate just the reverse, that the hemophilic blood contains less rather than more antiprothrombin, as compared with normal blood.

NOURSE, Cleveland.

THE DETERMINATION OF THE AMOUNT OF BLOOD IN THE CENTRAL NERVOUS SYSTEM AFTER INJECTION OF HYPERTONIC SOLUTIONS. ARTHUR WEIL, F. R. ZEISS and D. A. CLEVELAND, Am. J. Physiol. **98**:363 (Oct.) 1931.

Following intravenous injections of 15 per cent sodium chloride, the amount of blood in a dog's brain was increased from 8.3 to 13.2 cc. per hundred grams of brain weight. Following intravenous injections of a 30 per cent solution of sodium chloride and a 50 per cent solution of dextrose, the specific weight of the brain was increased from approximately 1.038 in normal animals to from 1.041+ to 1.043, and the amount of water in the brain was decreased from an average of 77.6 to 76.9 per cent.

NOURSE, Cleveland.

THE INDUCTION OF PRECOCIOUS SEXUAL MATURITY BY CORTICO-ADRENAL EXTRACT. E. L. COREY and S. W. BRITTON, Am. J. Physiol. **99**:33 (Dec.) 1931.

Precocious maturation of the sex glands of young albino rats was produced by the injection of cortico-adrenal extract (Swingle-Pfiffner). Marked effects were observed in the ovaries of animals 28 days old, but appearances of early maturity in the testes were not so striking, and occurred later. Hypertrophy of the pituitary gland, especially of the anterior lobe, was also noted, and the possibility was entertained that the effect on the gonads was secondary to this effect.

NOURSE, Cleveland.

STUDIES ON THE PHYSIOLOGY OF SECRETIN: IV. THE EFFECT ON THE SECRETION OF BILE. E. U. STILL, J. W. MCBEAN and F. A. RIES, Am. J. Physiol. **99**:94 (Dec.) 1931 .

Secretin injected intravenously into a dog was found to increase the flow of bile. The dose necessary for this action is small. Large doses do not cause the marked increase in outpouring of bile noted after large doses of bile salts.

NOURSE, Cleveland.

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THE OSMOTIC RELATIONS OF BLOOD AND GLANDULAR SECRETIONS: I. THE REGULATORY ACTION OF TOTAL BLOOD ELECTROLYTES ON THE CONCENTRATION OF GASTRIC CHLORIDES. ALFRED GILMAN and GEORGE R. COWGILL, Am. J. Physiol. **99**:172 (Dec.) 1931.

The authors present experiments to show that the total chloride content of pure gastric juice obtained in response to a histamine stimulus from dogs possessing gastric fundic pouches is approximately equal to the total ionic content of the blood. Variations in the total concentration of blood electrolytes produced by alternate dehydration and hydration of the animal were associated with parallel changes in the chloride content of the gastric secretions. NOURSE, Cleveland.

CALCIUM-PHOSPHORUS METABOLISM IN THE CHICKEN: III. INFLUENCE OF CEREALS AND VITAMINS A AND D. EARL J. KING and G. EDWARD HALL, Poultry Sc. **10**:332, 1931

The addition of 1 drop daily of 250-D ergosterol per bird to an otherwise rachitogenic diet fed to growing chicks resulted in the production of normal birds. The addition of oatmeal to the diet induced a more severe rachitic condition of the birds, which was partly overcome by the daily administration of 1 drop of 250-D ergosterol. Addition of vitamin A in the form of carotene did not improve the condition of birds on rachitogenic diets. The anticalcifying action of oatmeal was increased by boiling the meal for two hours with 1 per cent hydrochloric acid (without subsequent dialysis) followed by neutralization with sodium hydroxide. Extensive data showing the ash, calcium, phosphorus and phosphatase content of the bones and the calcium and phosphorus content of the blood serum of the chicks are tabulated. KUGELMASS, New York.

SOME OBSERVATIONS ON THE DISTRIBUTION OF ANTITOXINS IN SERUMS. M. BARR, A. T. GLENNY and C. G. POPE, Brit. J. Exper. Path. **12**:217 (Aug.) 1931.

The use of solid ammonium sulphate for the fractionation of antitoxic serums has many advantages over the use of saturated solutions. The quantities should be expressed in terms of grams of the salt per gram of serum and not as percentage of saturation, since this is variable according to the temperature. The quantity of ammonium sulphate necessary to precipitate a given proportion of antitoxin may be altered by the addition to the serum of an excess of either of the nonantitoxic proteins, euglobulin or serum albumin. When serums that are blended exhibit differences in antitoxin distribution, as determined by salting-out methods, some redistribution of antibodies occurs. When the blends are two globulin fractions containing different types of antitoxin, one removed at a low and the other at a high concentration of the precipitating salt, redistribution of the antibodies from both fractions occurs; any quantity of precipitant sufficient to cause separation of protein precipitates both types of antitoxin, though in different proportions. KUGELMASS, New York.

Nutrition

THE ROENTGEN DIAGNOSIS OF RICKETS. RALPH S. BROMER, Am. J. Roentgenol. **23**:469 (May) 1930.

The author reviews the clinical manifestations, the development of a pathologic condition of the bones, the roentgen appearance of normal and rachitic long bones and the differential diagnosis, and presents roentgen pictures. The roentgen changes in the long bones in rickets can be divided into two main types, the first showing no cupping of the diaphyseal ends and the second showing cupping as the distinguishing characteristic. The cupping can be explained on a mechanical basis. The first group is further subdivided into mild and severe; the second is the more usual form. In certain early cases in which roentgen signs are lacking,

diagnosis depends on clinical signs, such as Harrison's groove, rachitic rosary and laxity and lateral mobility of the knee joints; these signs may be present when no deviation is present roentgenologically. Serial roentgenograms are useful, and are an absolute necessity to check the effect of any therapeutic agent on healing. Roentgen examination is valuable for the determination of the proper time for operative intervention, as has been stressed by Lovett. Fragmentation of the inner borders of the lower epiphyseal center of the femur and of the lower, inner border of the diaphysis of the femur, and of the upper epiphyseal center and the upper and lower inner borders of the diaphysis of the tibia occurred with sufficient frequency to suggest that this is an end-result of the rachitic process.

STULIK, Chicago.

EVAPORATED MILK IN INFANT FEEDING. CHARLES GILMORE KERLEY, Arch. Pediat. **49**:22 (Jan.) 1932.

The author's comment is as follows: "We have in evaporated milk a substitute not only for human milk but a substitute for fresh cow's milk—a cow's milk product through changes brought about in the process of fabrication of such a nature as to render it easier of utilization by the infant's gastro-intestinal system. It is sterile, consequently safer for summer feeding purposes. For the subnormals from any cause, cooking the evaporated in the starch solution renders it easier of assimilation. It is flexible and lends itself to individual adaptation through the addition of water, starch and sugar. In diarrheal convalescents, the addition of water, starch, Karo and lactic acid furnishes a satisfactory feeding plan for this type of child. In celiac disease, evaporated milk possesses all the disadvantages of fresh milk."

WADDELL, University, Va.

EFFECT OF VITAMIN B COMPLEX DEPLETION ON INFANT MORTALITY. S. MAURER and LOH SENG TSAI, Illinois M. J. **61**:30 (Jan.) 1932.

Maurer and Loh Seng Tsai report that an analysis of the mortality of infants who die during their first year, in Illinois, shows that 44 per cent die under 1 week of age. The decrease in mortality of infants under 1 year of age from 1925 to 1928 was 1.488, while there was a decrease in those who die under 1 week of age of only 213. The infant mortality of the offspring of mother rats receiving a diet that is adequate only for the normal maintenance of a nonpregnant rat is high, 71 per cent, as compared with 8.5 per cent for animals under 3 days of age—an age equivalent to about 1 week in the human infant—born of normal mothers. A female rat which, during the period of gestation or while a nursling, has received only sufficient vitamin B complex for maintenance when not pregnant suffers a dystocia. Analysis by Goldberger of the consumption of food of wage earners shows that December, January, February, March, April, May and June are months in which the diet contains less than the optimal maintenance of vitamin B complex, and statistics for Illinois show that there is a higher mortality of infants less than 1 month of age during these months than during August, September, October and November, the four months of lowest infant mortality. The months of lowest mortality of infants under 1 month of age are those in which the mothers have had two or more months, just prior to the birth of the child, of a diet containing more vitamin B complex than is required for maintenance. The ordinary minimal maintenance diet, from a standpoint of vitamin B complex, must be practically doubled during pregnancy in order that strong, healthy offspring may be produced with the least damage to the mother.

BARBOUR, Joliet, Ill.

BASAL UREA ELIMINATION. CHARLES RICHET, JR., J. Lab. & Clin. Med. **15**: 9 (Oct.) 1929.

The elimination of basal urea is measured in terms of the elimination of urea per square meter of body surface over a period of twenty-four hours, with the

patient in an ideal state of nitrogen equilibrium. The elimination of the urea rather than that of the nitrogen was measured because of the greater simplicity. The relation between urea nitrogen and the total elimination of nitrogen in urine is always constant.

The chief consideration in determining the elimination of basal urea is dietary. It was found that the elimination of urea is minimal on a combined fat and sugar diet (6 Gm. of sugar and 6 Gm. of fat per kilogram of body weight). The urea elimination per square meter was always about the same (about 7.65 Gm.). In nitrogen equilibrium the elimination of urea is proportional to the surface and not to the weight of the body. If a man has a sufficient number of calories (about 3,000 Gm. per day in his dietary), nitrogen equilibrium is the same whether his intake consists of 8, 10 or 14 Gm. of protein. The elimination of nitrogen in any of these cases corresponds to the carburation of 19 Gm. of protein. If it is impossible to feed a man for ten or twelve days without protein, it is not difficult to provide him with a diet which he can tolerate and which contains only from 12 to 14 Gm. of protein. This was tested on ten adults and twelve children, with satisfactory results. Nitrogen equilibrium was established by from the seventh to the tenth day. For the next three days the elimination of urea was measured. By this method it was found that the elimination of urea per square meter per day for an adult averages 2.5 Gm. Individual differences are greater than class differences and range from 2 to 3 Gm. per square meter per twenty-four hours. In the children studied the results were as follows:

From 4 to 6 years (four children), 1.65 Gm.
From 7 to 9 years (four children), 1.97 Gm.
From 10 to 12 years (two children), 3.46 Gm.
From 13 to 14 years (two children), 3.95 Gm.

It was definitely shown that the elimination of basal urea, slight in the early years, increases suddenly in about the tenth year, with a maximum toward the fifteenth year. The elimination of basal urea represents the elimination of urea per square meter of body area with a protein diet insufficient to cover the needs of the organism, but containing a sufficient number of calories for maintenance. On such a diet, instead of having an excess consumption of protein, one has a dearth consumption. As a consequence, the organism will burn a portion of its own protein in order to maintain life. Since the caloric needs are covered, the body will burn just the quantity of protein necessary for maintenance.

WILSON, Norfolk, Va.

THE EFFECT OF PARTIAL DEPLETION OF VITAMIN B COMPLEX UPON LEARNING ABILITY OF RATS. S. MAURER and L. S. TSAI, J. Nutrition **4**:507 (Nov.) 1931.

An attempt is made to throw more light on the effects of depletion of vitamin B in human beings by a study of the effect of partial depletion of vitamin B complex produced during the nursing period on the higher nervous function or learning ability of the first and second generation of experimental animals. Maze learning tests were used.

The results indicate that: 1. Normal rats learn about twice as efficiently as the animals depleted of vitamin B. 2. Animals rich in vitamin B born of depleted parents learn about twice as efficiently as animals depleted of vitamin B from depleted parents. 3. When the offspring of depleted animals are brought up on a diet rich in vitamin B, their learning ability is practically equal to that of the normal animals. 4. When the offspring of the depleted animals are depleted of vitamin B complex during the nursing period, their learning ability is practically equal to that of the depleted parents. 5. The comparison in the maze records between the animals depleted of vitamin B and their own offspring brought up on a diet rich in vitamin B proves conclusively that the large differences in their learning ability are not due to the genetic factor of family strain, but to the dietary factor of depletion of vitamin B.

MUNNS, Winnetka, Ill.

RICKETS IN SYDNEY, AUSTRALIA. KEMPSON MADDOX, Arch. Dis. Childhood **7**:9 (Feb.) 1932.

In a series of 218 outpatient children of Sydney between the ages of 6 months and 2 years who were examined for signs of rickets, sufficient clinical evidence, according to a specified standard, for a diagnosis of past or present disease was found in 52 per cent, the higher incidence falling among patients between the ages of 9 and 12 months.

Of these children, 129 were examined roentgenologically. Signs of active rickets were found in 12.4 per cent and of healed rickets in 31 per cent. With 7 doubtful cases, the whole roentgenographic incidence amounted to 50 per cent.

On the whole the infants were well nourished, and the disorder was mild to moderate and occult. Correlation between the clinical and roentgenographic findings showed that marked rib beading and ligamentous laxity with abdominal and hepatic enlargement were the most frequent clinical signs in a small series of patients with roentgenologically active rickets. Symptoms of irritability and spasmophilia were rare; craniotabes and epiphyseal enlargement were notably absent. Apparently only a cautious reliance should be placed on alterations in size of the fontanel and on delay in teething or walking. Dentitional bronchitis is common.

Examination of the diets of these children showed that on theoretical grounds evidences of deficiency in vitamins A and D could be anticipated in 43 per cent. In 41 of 96 nursing mothers the diet was deemed unsatisfactory from this standpoint. Breast-fed infants provided over a third of the roentgenologically active, and a half of the healed, cases of rickets.

KELLY, Milwaukee.

EFFECT OF AMMONIUM CHLORIDE ADMINISTRATION ON METABOLISM IN INFANTILE TETANY AND RICKETS. NOAH MORRIS and OLIVE MACRAE, Arch. Dis. Childhood **7**:47 (Feb.) 1932.

Three patients with active rickets and tetany and one with healing rickets were given ammonium chloride in 1 Gm. doses five times daily. During the course of the study, the calcium, phosphorus and chlorine metabolism was investigated.

The administration of ammonium chloride produced no apparent signs of acidosis. There were a definite increase in the retention of calcium and phosphorus, a subnormal increase in the output of titratable acid and a marked retention of the excess chlorine in the group with tetany and rickets.

In the case of healing rickets there was a definite decrease in the retention of calcium and phosphorus, but a retention of the excess chlorine slightly above normal.

One patient who was given ammonium chloride over a period of five weeks showed roentgenologic and metabolic evidence of healing, although the dietetic and environmental conditions were kept unchanged.

The author concludes that there is no evidence of any tendency to acidosis in rickets.

KELLY, Milwaukee.

CHEMISTRY OF IRRADIATED ERGOSTEROL. A. WINDAUS, Proc. Roy. Soc., London, s. B. **108**:568 (Aug. 1) 1931.

On irradiation, ergosterol may be transformed completely into other compounds. The highly active antirachitic product is an intermediate derivative and is further changed into two inactive antirachitic compounds, neither of which can be converted into the other. Irradiation of ergosterol lowers the melting point, increases the solubility, changes the optical rotation from markedly levo to faintly dextro, and produces successive changes in the ultraviolet spectrum. The chief absorption band of the antirachitic compound (vitamin C) probably is at from 265 to 270 microns; it does not yield a precipitate with digitonin; it con-

tains a hydroxyl (OH) group that reacts with phenyl-isocyanate (C_6H_5NCO); it has the formula $C_{27}H_{43}O$ and probably is a metamere of ergosterol containing three double bonds; it loses its antirachitic power when heated *in vacuo* for four hours at a temperature of 180 C., and is not readily attacked by oxygen. Uncertainty exists as to whether the antirachitic action and the toxic action (hypercalcification) of very large doses of the irradiation product are due to the same or different compounds. The irradiation product was treated in ethereal solution with amleic anhydride, followed by diluted solution of potassium hydroxide; the portion that did not combine with the anhydride yielded crystalline needles of vitamin D on evaporation of the solvent. The crystalline compound was an isomere of ergosterol $[\alpha]\ \frac{18°}{D} = +138°$ (0.85 solution in acetone); $[\alpha]\ \frac{18°}{5641} = +169°$, m 122° to 123°; main absorption band at from 265 to 270 microns, absorption coefficient 1.44 (0.02 per cent) solution in ether; limiting antirachitic dose, 0.03γ (millionth of a gram). Windaus believes "that, in the photochemical transformation into vitamin D, the mol formula, the alc. group and the three double bonds remain unchanged, and that all that occurs is a steric or structural rearrangement which leads to an increase in the spatial size of the mol."

KUGELMASS, New York.

ALMOND JUICE IN INFANT NUTRITION. O. OSER, Schweiz. med. Wchnschr. **62**:91 (Jan. 23) 1932.

The pressed juice of almond is not a satisfactory baby food. An infant who had been fed nothing else but this raw extract and fruit since 6 weeks of age came under observation. Birth and early development had been normal, and the infant had seemed to thrive for a time on his diet. At 7 months, diarrhea, vomiting and intoxication developed, and he died of terminal pyelonephritis and colitis.

WOLMAN, Chicago.

THE RELATION BETWEEN AXILLARY AND SUBMAMMARY TEMPERATURES AND THE SECRETION OF MILK. TORQUATO TARAMELLI, Clin. pediat. **13**:939 (Dec.) 1931.

The author's desire to verify the law of Moll led him to investigate the differences that exist between axillary and submammary temperatures during the periods of parturition, puerperium and lactation.

In his studies he has never encountered constant or appreciable differences in the two temperatures among parturients nor during the puerperium; on the other hand, he has noted a marked and contant difference, almost always greater than 0.5 C. (32.9 F.), in all women who have a normal or abundant secretion of milk; no differences in these temperatures were noted in women who had a scant secretion of milk during the entire period of nursing.

SIGNORELLI, New Orleans.

RATIONAL THERAPY IN THE GASTRO-INTESTINAL DISTURBANCES OF INFANCY. GIULIO ROI, Prat. pediat. **10**:23 (Jan.) 1932.

Roi, who is associated with the Foundling Hospital in Verona, after a review of the existing methods of treatment of gastro-intestinal disturbances in infants, presents the protocols of eleven patients treated with a preparation vaguely described as a sulphur compound with lactic acid and a radical of colombium in an aromatic vehicle. Both the highly theoretical character of the discussion of the action of this preparation and the unconvincing nature of the case reports make the author's unqualified recommendation of the preparation seem premature.

DOOLEY, Kent, Conn.

THE LIPASES IN MILK. A. LUCCA, Riv. di clin. pediat. **29**:1056 (Nov.) 1931.

Using the method of Rona and Michaelis, the author was able to conclude that there exists in human colostrum and milk a lipase; its quantity is unaffected

by the length of time lactation has been carried on and is not proportional to the quantity of lipase in the blood serum. The milk of cows, sheep and goats does not contain lipase.

HIGGINS, Boston.

FRUIT AND VEGETABLE CARBOHYDRATE IN THE NUTRITION OF DIABETIC PATIENTS. A. ATHANASIOU, Deutsches Arch. f. klin. Med. **172**:358, 1932.

Chemical analyses of the carbohydrate content of various fruits and vegetables do not indicate their value in the diabetic diet, and should be supplemented by biologic assay. The author studied the effect on the blood sugar curve of the ingestion of different foods in quantities containing equivalent amounts (20 Gm.) of carbohydrate. Nuts, raw and cooked blackberries, raw peaches, cooked apples and turnips had the greatest value. Pears, grapes, bananas and oranges were next. Apricots, dried and cooked peaches, currants, pineapple, cherries and figs had the least value.

DOOLEY, Kent, Conn.

APPLE DIET AND BACTERIAL FLORA OF THE INTESTINES. W. SCHREIBER, Med. Klin. **27**:1452 (Oct. 2) 1931.

In German pediatric literature a great deal has been written in recent years on the treatment of acute diarrhea with an apple and fruit diet. The influence of this diet on the intestinal tract has been interpreted in many different ways. Some authors claim that its good effect is due to the change in the acidity of the bacterial content produced by the malic acids. Others think that the tannic acid present in the apples may have something to do with the success of the treatment. Still others try to explain it on a purely mechanical basis. The author studied the changes in the bacterial flora before and after treating his patients. In his series he had five cases of bacillary dysentery, one case of paratyphoid B and two cases of dyspepsia without the finding of dysenteric organisms. In all these cases he found that the apple diet produced a marked growth of the colon bacillus, while at the same time the suspicious and pathogenic organisms gradually disappeared. Clinical symptoms also improved rapidly. The quality of the coli strains was not changed, and therefore it is possible that the predisposition to diarrhea persists in spite of clinical improvement.

ZENTAY, St. Louis.

TOXICITY OF IRRADIATED ERGOSTEROL. O. GOTTCHE and B. KELLNER, Orvosi hetil. **74**:751 (July) 1931.

The toxic effects of irradiated ergosterol preparations were tried on rats. Three preparations made in Hungary were used. Histologic changes in internal organs were taken as a measure of toxicity. The authors found that the different preparations may have different toxic indexes. The healing and toxic effects do not go parallel, and therefore they do not seem to be identical. It is possible to produce preparations with good curative effect and hardly any toxic properties. Preparations of this type are without danger for infants and children. The dosage of irradiated ergosterol cannot be definitely studied before more is known about the chemical composition of photo-ergosterol.

The length of irradiation and the wavelength of the ultraviolet rays seem to have a definite part in the production of curative and toxic properties. These connections have to be studied more closely in the future.

ZENTAY, St. Louis.

CHANGES IN THE EYE AFTER FEEDING ANIMALS WITH ALTERED VITAMINS. O. KATAYAMA, Acta Jap. Ophth. Soc., Sept., 1931, p. 112.

In 1915, Erdmann reported that he had obtained in animals changes resembling xerosis in man, after using feed deficient in calcium. Frank described a disease produced by feed heated to 140 C. in which the clinical and pathologic

changes resembled those found in keratomalacia of rats. The author conducted a number of experiments on rabbits with feed composed of altered vitamins (beans heated to 120 and 130 C. each for three hours), and found the following changes: 1. After twenty-five days the cornea presented pathologic changes. Then part of the epithelium desquamated and was destroyed. 2. The retina showed changes after thirty-five days, which were most noticeable in the superficial and deepest layers. 3. The optic nerve presented marked changes. The axis-cylinders showed changes after fifty days, while the medullary sheaths showed changes after thirty days. The longer the experiments were tried, the more marked were the resulting symptoms.

KNAPP, New York. [ARCH. OPHTH.]

PASSAGE OF POWDERED MILK THROUGH THE GASTRO-INTESTINAL TRACT IN PUPPIES. K. ASAI, T. NAGATOMI and H. IKEBE, J. Pediat. (Tokyo), Sept. 20, 1931, no. 376, p. 1226.

The authors studied the time required for various preparations of powdered milk to pass through the gastro-intestinal tract of puppies. These preparations are used by mothers as the equivalent of whole cow's milk. They are compared with the fresh cow's milk, containing 3.4 per cent milk fat. The preparations in appropriate dilutions were mixed with thorium dioxide to the amount of 10 per cent of the entire bulk. The roentgenologic examination of the passage of these preparations was a means of determination. The authors found that the powdered milk passed in slightly less time than fresh whole milk. One preparation of powdered milk required 135 minutes for passage out of the stomach and 285 minutes for passage out of the small intestines; other preparations, 153 and 255 minutes, and 162 and about 270 minutes, respectively. The fresh whole milk passed the stomach in 189 minutes and the small intestines in 285 minutes.

KATO, Chicago.

CHEMICAL TEST FOR HUMAN AND COW'S MILK. S. NOSU, J. Pediat. (Tokyo), Sept. 20, 1931, no. 376, p. 1232.

By treating the milk to be tested with 10 per cent sodium tungstate and 20 per cent trichloracetic acid, which precipitate proteins, and by changing the reaction of the filtrate to distinct alkalinity by means of sodium carbonate with phenolphthalein as an indicator, the author devised a method of chemically distinguishing human milk from cow's milk. In human milk the alkaline solution so obtained will be clear, while in cow's milk there will be a white, turbid precipitate.

KATO, Chicago.

IDIOSYNCRASY AGAINST COW'S MILK. E. GORTER, Nederl. tijdschr. v. geneesk. **75**:5192 (Oct. 17) 1931.

A case of idiosyncrasy against cow's milk is described, in a clinical lecture, and a discussion of the therapy is given.

VAN CREVELD, Amsterdam, Holland.

DIGESTION LEUKOPENIA AND DIGESTION LEUKOCYTOSIS IN CHILDREN WITH FEVER. M. D. HIDAYAT, Nederl. tijdschr. v. geneesk. **75**:6074 (Dec. 19) 1931.

The influence of digestion on the blood was investigated in twelve children suffering from different infections. The symptoms of infection (deviation to the left, toxic granulation, vacuolation and other degenerative symptoms) and the number of white blood corpuscles were not influenced by digestion; in spite of this the author recommends examination of the blood during fasting.

VAN CREVELD, Amsterdam, Holland.

Prenatal Conditions

CONGENITAL HEART DISEASE WITH MULTIPLE CARDIAC ANOMALIES: REPORT OF A CASE SHOWING AORTIC ATRESIA, FIBROUS SCAR IN MYOCARDIUM AND EMBRYONAL SINUSOIDAL REMAINS. SAMUEL BELLET and B. A. GOULEY, Am. J. M. Sc. **183**:458 (April) 1932.

A case of congenital heart disease in an infant that lived but twelve hours is presented. A number of anomalies existed, among them atresia of the aorta, hypoplasia of the left ventricle, premature closure of the foramen ovale, dilatation of the right auricle and ventricle, a small left auricle and fibrosis of the left ventricular myocardium, and in addition a rare anomalous finding, namely, the remains of the sinusoids of the embryonic heart.

Photographs of the gross specimen and of microscopic sections are given. It is interesting to note the union of an artery with a sinusoid in serial sections.

The persistence of sinusoids or intratrabecular spaces after birth is exceptionally rare. Only one other definite case has been reported. A fairly lengthy but comprehensive discussion of the embryology and physiology of these spaces is presented. Briefly, early in embryonic growth the auricular myocardium is pierced by outgrowths from the endothelial lining of the auricle, forming capillary spaces between the muscle and epicardium. Similar outgrowths later appear from the ventricle. These are observed as wide spaces between the growing muscle bundles, and their continuation into the compact myocardium cannot be distinguished from the fine ramifications of the veins and arteries; consequently, all three appear together as a capillary network. It seems to be generally conceded that sinusoidal circulation is replaced by coronary circulation. HENSKE, Omaha.

ABSENCE OF THE CERVICAL SPINE. GEORGE I. BAUMAN, J. A. M. A. **98**:129 (Jan. 9) 1932.

The Klippel-Feil syndrome consists in a numerical variation in the cervical vertebrae with more or less complete fusion into one mass and is accompanied sometimes by other anomalies, such as spina bifida. It is characterized by a short neck, a lowered hair-line on the back of the neck and limited motion of the neck. Reports of six cases are appended. BONAR, Salt Lake City.

SPINA BIFIDA AND CRANIUM BIFIDUM. WILDER PENFIELD and WILLIAM CONE, J. A. M. A. **98**:454 (Feb. 6) 1932.

Of thirty-three patients with spina bifida, cranium bifidum and rachischisis, nineteen presenting either a posterior cranium bifidum or spina bifida were operated on, with no deaths. Amputation of meningocele sacs will precipitate acute hydrocephalus, and should not be performed unless there is no continuity between the sac and the cerebrospinal fluid space. Such an operation is described.

BONAR, Salt Lake City.

THE RELATION OF CONGENITAL DEFORMITIES OF THE HAND TO CERVICAL RIBS. R. V. FUNSTON, J. A. M. A. **98**:697 (Feb. 27) 1932.

Both a mother and child had bilateral absence of the radius with club hand deformity and well developed cervical ribs. Two patients seen previously with club hand were reexamined and found to have cervical ribs, and another case was recently found. The author finds no mention of any association of the two deformities. Whether or not the presence of cervical ribs and club hand is coincidental in the five cases reported or comprises a heretofore unrecognized association of deformities cannot be stated. BONAR, Salt Lake City.

CONGENITAL MALFORMATIONS OF THE DIGESTIVE TRACT. JOHN LOVETT MORSE, M. Clin. North America **15**:823 (Jan.) 1932.

Morse discusses briefly a series of cases of conditions that present many symptoms in common but that differ materially in etiology, prognosis and treatment, viz., congenital atresia of the esophagus, spasm of the cardia with secondary dilatation of the esophagus in a hypertonic infant, hypertrophic stenosis of the pylorus and unrotated colon with obstruction of the intestine.

SMITH, Ogden, Utah.

CONGENITAL OBSTRUCTION OF THE FEMALE URETHRA. OSWALD ADDISON, Arch. Dis. Childhood **7**:25 (Feb.) 1932.

This is a case report of a girl 4 years old who showed congenital obstruction of the urethra. At autopsy the bladder, kidney, pelvis and ureters were thickened and dilated. In the middle of the urethra a fold of mucous membrane was found on the posterior wall. This fold acted as a valvular obstruction.

KELLY, Milwaukee.

CONGENITAL LYMPHANGIECTATIC FIBROUS HYPERTROPHY. D. STEWART MIDDLETON, Brit. J. Surg. **19**:356 (Jan.) 1932.

This type of congenital overgrowth is rare. The cases are divided into two groups: one in which the whole limb is involved, all tissue being equally affected and producing a condition of local gigantism, and the other in which there is an overgrowth affecting only separate tissues, and producing local deformities. A case of this type is described occurring in an infant at birth. Pathologically, there is a lymph or lymph-vascular dilatation as a primary developmental fault, followed by the replacing of the normal tissues by fibrous tissue.

SUMMERFELDT, Toronto, Canada.

AN EMBRYONIC TUMOUR OF THE KIDNEY IN FOETUS. G. W. NICHOLSON, J. Path. & Bact. **34**:711, 1931.

This is an account of a single case, with a comparison with physiologic development. I use the name "embryonic tumor" instead of "mixed tumor" or "adenosarcoma," as it accentuates the most characteristic morphologic feature of the tumor: It mimics or, as I try to show, retains the structure (and functions) of the developing kidney with a surprising degree of accuracy, in general outline and in detail. It is an interesting fact, used to the present day as an argument for the "congenital" origin of tumors in general, that the specimen, like other of its kind, was present at birth. It is therefore congenital and embryonic in every sense. And it is true that by far the greater majority of these tumors are observed in the first years of life. But birth is a mere incident in the life of the individual. It introduces him to a new environment to which he must adapt himself: His physiologic reactions are modified and evoked, but no new reactions are acquired. Does not this argument apply with equal force to his reactions to an abnormal, or accidental, environment inside and outside the uterus? I see these embryonic tumors of the kidneys having their chief importance for oncology, not as congenital new growths, but as developmental malformations: They represent the physiologic evolution of a somatic tissue after abnormal stimulation at a time when growth is active and differentiation begins. They differ from the developing organ in that growth continues and differentiation is aborted. The tumor, as I conceive it, does not arise in a malformed organ, but represents—and is—the malformed organ. Paul (1886) very rightly observed that "a normal tissue is just as congenital as a rudiment" or cell rest. Every tumor—like every physiologic organ—is truly congenital and truly acquired, whether it arises in an embryo as a reaction to an unknown stimulus or in a centenarian as a reaction to x-rays, soot, tar or what not. For the reaction is innate in either case, and therefore con-

genital and entirely physiologic; the stimulus alone is extraneous to the reacting part, acquired and pathologic. This is the plain teaching of pathology—free from theory—as I understand it.

AUTHOR'S SUMMARY. [ARCH. PATH.]

THORACIC DISPLACEMENTS OF THE GASTRO-INTESTINAL TRACT. ALBERT JUTRAS, Union méd. du Canada **61**:471 (March) 1932.

In the least severe congenital hernias compatible with relatively good health, which are most frequently found through roentgen examination made in adult life for vague digestive disturbances, G. Kuss expressed the belief that one should abstain from operation. He has not seen any cures, and he has seen unjustifiable deaths caused by these serious interventions. But other surgeons, Pierre Duval in particular, have mentioned operations that have been successful.

The single personal observation that the author is able to express is that he has found by screening left diaphragmatic hernias, more or less voluminous, without clinical symptoms that would lead one to suspect them.

DRAKE, Toronto, Canada.

SKELETAL CONDITIONS IN CRANIORACHISCHISIS AND CRANIOSCHISIS. E. GIERKE, Centralbl. f. allg. Path. u. path. Anat. **53**:1, 1931.

Gierke studied the skeletal and particularly the cranial alterations in a craniorachitic and an anencephalic monster and compared them with normal fetuses 17 cm. and 46 cm. in length. He made paper models of the occipital bone, and by flattening or bending these he was able to approximate conditions found in the deformities in question. He is of the opinion that pressure of some sort is the cause of these arrests in development, but offers no suggestion as to the origin of such pressure.

RUKSTINAT, Chicago. [ARCH. PATH.]

CONGENITAL LEUKEMIA. W. BÜNGELER, Frankfurt. Ztschr. f. Path. **41**:257, 1931.

Leukemia is reported in a stillborn infant of about seven months' gestation, measuring 39 cm. in length and weighing 1,620 Gm. The liver was enlarged, weighing 125 Gm.; its architecture was completely obscured. Histologically, there were large myelocytic infiltrations between the capillaries and the hepatic cells. The cells revealed eosinophilic and neutrophilic granules. Relatively few nucleated red cells were found. The spleen weighed 55 Gm. The follicles were not recognizable. Histologically, a marked infiltration was noted by cells similar to those found in the liver. The architecture of the lymph nodes was obscured. No follicles or germinal centers could be made out. There was a fine reticulum in the meshes of which many myeloid cells were observed. The bone marrow was outspokenly gray, with a few red dots; it showed few erythroblasts and erythrocytes, but many myeloblasts, and neutrophilic and eosinophilic myelocytes. Four fifths of the cells gave a positive oxydase reaction. No iron-containing pigment was noted. Many myeloid cells were found in the myocardium, lungs, kidneys, pancreas, gastro-intestinal tract and skin. At postmortem examination, smears taken from the blood of the vena cava and heart revealed 80 per cent myeloblasts and myelocytes. The author discusses the question of whether this disease is identical with the leukemia of the adult.

SAPHIR, Chicago. [ARCH. PATH.]

THE PATHOGENESIS OF A RARE MALFORMATION OF THE HEART (COR TRIATRIATUM). J. HAGENAUER, Frankfurt. Ztschr. f. Path. **41**:332, 1931.

Cor triatriatum in a 4 months old child is reported. The heart was enlarged owing to marked hypertrophy of the right ventricle; the left ventricle was small and gave the impression of being an appendage to the right ventricle. The right auricle was dilated and revealed the normal openings of the superior and inferior

vena cavae. The interauricular septum showed an opening that led from the right into a small left auricle. This left auricle had no communication with the left ventricle, but formed a small blind-ending sac. The four pulmonary veins, however, opened into this auricle. When the left ventricle was opened, it was noted that it led through a normal mitral valve into a second left auricle. This second auricle revealed no communications with the first left auricle or with the pulmonary veins. A small auricular appendage, however, was attached to it. An open foramen ovale led from the second left auricle into the right auricle. The blood stream apparently flowed from the pulmonary veins into the first left auricle and from there through the open intra-auricular septum into the right auricle. Some of the blood passed into the right ventricle and some through the open foramen ovale into the second left auricle and from there into the left ventricle and the aorta. The possible conditions leading to this rare malformation are discussed. The underlying cause is apparently a secondary occlusion of the pulmonary vein, which primarily was open.

SAPHIR, Chicago. [ARCH. PATH.]

A CASE OF CONGENITAL DEXTROCARDIA WITH MUSICAL MURMURS OF THE HEART. F. SCHLESINGER, Med. Klin. **27**:1715 (Nov. 20) 1931.

In a case of congenital dextrocardia without any abnormalities in the position of other organs, diastolic musical murmurs were noted. Physical examination and electrocardiography did not reveal any other congenital or acquired lesions of the heart. The origin of musical murmurs is obscure, and the author is not in a position to give any satisfactory explanation. A noteworthy feature of this case is that the murmur was diastolic. Musical murmurs are harmless as such, and this fact should be recognized; otherwise the child will be subjected to treatment as an invalid, with serious damage to his physical and psychic development.

ZENTAY, St. Louis.

GLYCOGEN CONTENT OF THE PLACENTA AND THE FETAL LIVER IN ARTIFICIAL HYPERGLYCEMIA. R. KEBLER, Ztschr. f. Geburtsh. u. Gynäk. **98**:487, 1930.

The author investigated the glycogen content of twenty-three placentas and seventeen fetal livers at different months of pregnancy. In some cases, he produced hyperglycemia in the mother by the administration of dextrose.

The mature placenta contains an unchanged, small glycogen content (about 0.1 Gm. per hundred cubic centimeters). This amount is not changed by alimentary hyperglycemia, and shows that during the second half of the pregnancy the placenta has no regulating function in the metabolism of sugar between mother and child. There is only a simple diffusion. The liver of the mature fetus contains large amounts of glycogen (about 3.4 Gm. per hundred cubic centimeters).

During the development of the fetus, the glycogen content of the placenta decreases, while the glycogen content of the fetal liver increases. After the early fetal months, the fetal liver takes the place of the placenta in the carbohydrate metabolism. Therefore, the fetal carbohydrate metabolism is independent of the mother.

ADAIR and SIEDENTOPF, Chicago.

A CASE OF HERMAPHRODISM. ERICH STERN, Ztschr. f. Kinderforsch. **38**:685 (Aug. 15) 1931.

The author reports a case of malformation of the external genitals associated with lesions of the central nervous system apparently due to congenital syphilis.

REICHLE, Cleveland.

A CASE OF HYPOPLASIA OF THE MANDIBLE WITH ATTACKS OF CYANOSIS. A. VAN WESTRIENEN and T. JAGERINK, Nederl. tijdschr. v. geneesk. **75**: 5223 (Oct. 17) 1931.

A case of this rare condition is reported in a child with a cleft palate. A special apparatus is described by which the mandible was displaced forward and

which gave splendid results. When the child was 8 months old the apparatus could be omitted for a long time without the occurrence of new attacks of asphyxia.

VAN CREVELD, Amsterdam, Holland.

A CASE OF DOUBLE DEVELOPMENT OF THE PENIS AND SCROTUM (DIPHALLIA). R. J. HARRENSTEIN, Nederl. tijdschr. v. geneesk. **75**:5293 (Oct. 31) 1931.

A case of diphallia, a very rare condition, and the treatment are described. Examination of the child showed that the doubling was restricted to the exterior sexual organs. From a comparison with other reported cases of this malformation it appeared that the deviation in this case must have been caused by a double formation of the sexual knob and adjacent parts.

VAN CREVELD, Amsterdam, Holland.

Diseases of the New-Born

COMMUNICABLE SORE EYES IN THE NEW-BORN. ANSON B. INGELS, Rhode Island M. J. **15**:43 (March) 1932.

During the seven year period from Jan. 1, 1925, to Oct. 27, 1931, 118 cases of communicable sore eyes of the new-born were reported to the Rhode Island State Health Commission. In 1.3 per cent there was total or partial loss of sight. The rôle of organisms other than the gonococcus in causing this condition was recognized, e. g., that of the Koch-Weeks bacillus, the pneumococcus, the colon bacillus, Bacillus xerosis, staphylococci and streptococci. Four causes were emphasized as responsible for failure in prevention: (1) failure to instil 1 per cent silver nitrate solution; (2) improper technic of instillation; (3) use of solutions decomposed by light or organic matter, and (4) use of solutions not standardized, or made from untried germicides.

When applied to the conjunctiva within twelve minutes after birth 1 per cent silver nitrate has been found to be instantly effective. The author endorses this application in spite of objections that its action may be possibly escharotic, and believes that with proper care all cases of communicable sore eyes in the new-born can be prevented.

GRAVES, New York.

DYSTOCIA CAUSED BY A SACROCOCCYGEAL TUMOR OF THE INFANT. A. LEVANT, J. RAVINA and M. SUREAU, Bull. Soc. d'obst. et de gynéc. **21**:105 (Feb.) 1932.

A diagnosis of a breech presentation was made in the eighth month of pregnancy in the case of a 24 year old woman. After twenty-eight hours of labor, extraction was attempted, but could not be carried out because of a large mass attached to the infant. The mother was given an anesthetic, and a sacrococcygeal tumor was diagnosed. The child was delivered and found to be a boy weighing 4,020 Gm. There was a cystic tumor about the size of the head of a new-born child attached by a broad base to the region between the root of the scrotum and the sacrococcygeal area. Two photographs are included in the report. The anal orifice opened at the beginning of this mass. The skin covering the mass was violet-red, and the tension within it was not increased when the child cried. Except for the tumor, the child showed no abnormality. In the mother, an infection of the uterus developed, which necessitated a subtotal hysterectomy, but she made a good recovery. The infant gained weight and developed properly until the age of 22 days; then an ulcer of the tumor developed, followed by discharge of a gelatinous fluid. The mass was then opened and found to contain only gelatinous fluid; it was partly excised, and the remainder was packed with iodoform gauze. Histologic examination of the tissue removed was not made, but the mass was thought to be epidermal, not dermoid. The infant was considerably shocked by the operation, but recovered, and at the age

of 6 months weighed 5,350 Gm. The mass had disappeared, but the skin of the buttocks was considerably thickened and scarred with many wrinkles and furrows. There was no fistula. Rectal examination showed that there was no deeper mass attached to the sacrum or to the coccyx. JEROME GLASER, Rochester, N. Y.

DEATH RATES IN THE NEW-BORN. A. COUVELAIRE, P. LEREBOULLET and M. LACONNUE, Nourrisson **20**:1 (Jan.) 1932.

Under the laws of France, a baby dying during the first three days post partum may be reported as stillborn. This makes comparison of statistics with those of other countries rather difficult. In France the annual death rate in the new-born (up to the age of 10 days) has steadily fallen from 31 to 17 per thousand during the past forty years, while the rate of the stillborn has fallen only from 48 to 35 per thousand.

The mortality rates for different sections of France are analyzed and compared with the figures for other countries. McCLELLAND, Cleveland.

PERITONITIS IN TWINS. H. SLOBOSIANO, Nourrisson **20**:26 (Jan.) 1932.

Twin girls were born with abdominal distention and other signs of peritonitis. Fluid obtained by paracentesis was cloudy and contained pus cells. Cultures were positive for Bacillus faecalis-alcaligenes. Deaths followed in thirty-six hours and at six days. The postmortem findings were practically the same in each infant. In addition to acute fibrinous peritonitis there were atresias of the small intestines a short distance above the ileocecal valve and infarcts in the lungs and pancreases. The fact that there was no bile pigment below the atresias leads the author to believe that this narrowing of the bowel must have occurred before the fourth month of fetal life, at which time the secretion of bile begins.

McCLELLAND, Cleveland.

PEMPHIGUS NEONATORUM. JUAN CORDOBA, But. soc. catalana de pediat. **1**:23 (Oct.) 1928.

A case of pemphigus neonatorum is presented. The author emphasizes that, contrary to the views of dermatologists, this is a bacteriologic and pathologic entity and bears no relation to the ordinary impetigo. His patient was successfully treated with convalescent serum and potassium permanganate baths.

WATSON, Elmhurst, Ill.

OBSTETRIC TRAUMA OF THE CENTRAL NERVOUS SYSTEM IN THE NEW-BORN. WIEDERHOLD, Rev. chilena de pediat. **2**:586 (Dec.) 1931.

The author advocates exploratory lumbar puncture in all new-born infants who present vague neurologic symptoms that cannot well be defined by physical examination and that may be due to obstetric trauma. SCHLUTZ, Chicago.

TREATMENT OF ASPHYXIA IN THE NEW-BORN AS WELL AS OF DISTURBANCES OF BREATHING IN THE NEW-BORN AND IN INFANTS WITH CARBON DIOXIDE GAS MIXTURES. RUDOLF WIENER, Arch. f. Kinderh. **95**:65 (Dec. 18) 1931.

Wiener discusses various methods of treating asphyxia in the new-born and disturbances of breathing in the new-born and in infants, calling particular attention to the use of carbon dioxide-oxygen mixtures. A portable apparatus is described for administering the mixture, which contains usually 5 per cent carbon dioxide and 95 per cent oxygen. Good results were reported from the treatment in twelve cases of aphyxia of the new-born, twenty-three cases of severe disturbance of respiration in the first day of life, six cases of collapse in nutritional disturbance and seventeen cases of diseases of the air passages and lungs.

LESLIE, Evanston, Ill.

THE DIFFERENTIAL BLOOD PICTURE IN THE NEWLY BORN. W. BAYER, Jahrb. f. Kinderh. **134**:304 (Feb.) 1932.

Differential counts (but no total counts) in twenty normal newly born infants revealed the presence of many early forms of polymorphonuclear cells, a percentage of polymorphonuclears of from 62 to 75 the first day of life and from 38 to 62 from the third to fifth days. In nineteen infants delivered by cesarean section, the percentage of polymorphonuclears was also high. In the blood of young mice and kittens subjected to air containing from 10 to 15 per cent carbon dioxide, there appeared many early polymorphonuclears.

CLAUSEN, Rochester, N. Y.

CLINICAL DIAGNOSIS OF INTRACRANIAL BIRTH HEMORRHAGE. W. CATEL, Monatschr. f. Kinderh. **52**:1 (Feb.) 1932.

Catel made simultaneous determinations of bilirubin in the blood and spinal fluid of new-born infants. Both the icterus index — i. e., potassium bichromate solution of Meulengracht — and the van den Bergh test were used. He divides the infants into groups ranging in birth weight from 1,000 Gm., the lowest, to 4,100 Gm., the highest. Curves are shown contrasting the pigment findings in the blood serum and the spinal fluid. On the basis of these curves, he attempts the diagnosis of cerebral hemorrhage. Eighty-six children in all were studied, of whom forty-nine had suffered from intracranial hemorrhage. Many children who were not suffering from birth trauma showed pigment in the spinal fluid. The children of primiparae are more apt to suffer injury. There is a definite predisposition of premature and very small infants to cerebral hemorrhage.

Catel offers the conclusion that birth trauma is not particularly dangerous per se. The deaths that occurred were usually from complicating pneumonia or intestinal infection. Of twenty-four children injured at birth, five died during the first six months, one developed into an idiot, and the remaining eighteen recovered and remained in perfect health.

GERSTLEY, Chicago.

THE ETIOLOGY OF SUBCUTANEOUS FAT NECROSIS OF THE NEW-BORN. E. UNSHELM, Monatschr. f. Kinderh. **52**:321, 1932.

Unshelm reviews the various theories of the etiology of scleroderma, which he prefers to call "fat tissue necrosis." Of the various theories he prefers the one which states that the areas of infiltration are due to trauma. He reports several cases supporting this hypothesis. He believes that the trauma results in local asphyxia. From this he argues that the sites of predilection, such as the back, the buttocks and the extensor surfaces of the extremities, are parts of the body especially prone to pressure by the uterine wall. Presumably in all of these examples the circulation to the affected parts was obstructed.

GERSTLEY, Chicago.

HISTOLOGIC AND EXPERIMENTAL INVESTIGATIONS OF THE EFFECT OF PREGNANCY ON THE GONAD IN THE NEW-BORN. H. O. NEUMANN, Ztschr. f. Geburtsh. u. Gynäk. **94**:100, 1930.

The author investigated the effect of pregnancy on the genitalia of the child in the uterus. To ascertain the intra-uterine hormonal influence on the female genital organs, the author investigated forty-six pairs of ovaries of mature females and ten pairs of ovaries of younger fetuses. He also found signs of maturity and atresia of the follicles in the ovaries. He found further that in every case an enormous augmentation of the uterus occurred during the last weeks of intra-uterine life. Hyperemia and sometimes an extravasation of blood into the uterine cavity were also noticed. After birth, an involution of the uterus takes place.

In order to prove which agents are the cause of these changes, the author injected serum and urine of female new-born mice into infantile and castrated

female mice. He found that the ovarian hormone and the anterior pituitary hormone are in the organism of the new-born and evoke the aforementioned changes of the genital organs of the female fetuses. These hormones are eliminated in the urine during the first days after birth.

The author also investigated the intra-uterine hormonal influence on the male genital organs. In the male, as in the female new-born, changes of the mammary glands are noticed. The author injected female sex hormone preparations into young male guinea-pigs, and he observed a swelling of the mammary glands. Therefore, he believes that the ovarian hormone of the mother causes the swelling of the mammary glands in the new-born males. A secretion does not appear before the ovarian hormone is eliminated. The prostate of new-born males is remarkably large in all cases. In the testicles of new-born males, the author could perceive signs of involution by microscopic investigation. He injected ovarian substance into young male mice. He noticed that the ovarian hormone had an arresting influence on the growth of the male genital organs. It was also noticed that the anterior pituitary hormone injections caused a premature maturation of the male gonad. From his investigations and observations the author concludes that the findings in the prostate and the testicle of the human male new-born infant are also an effect of hormonal influence, and that these hormones circulate in the blood of the new-born. He cannot determine whether all these agents originate from the maternal organism or from the placenta.

ADAIR, Chicago.

CRITICISM OF THE MODERN PROPHYLAXIS OF BLENNORRHEA IN THE NEW-BORN BY MEDICAMENT. H. HELLENDALL, Ztschr. f. Geburtsh. u. Gynäk. **99**:522, 1931

The prophylaxis of blennorrhea in the new-born by the administration of a solution of silver nitrate in the eyes involves the following dangers: (1) mistaking a 10 per cent solution for a 1 per cent solution; (2) concentration of the solution by evaporation, after standing too long, and (3) decomposition of the solution after standing too long and formation of free nitric acid. In this way the eyes of the new-born may be endangered. The author cites cases of loss of sight reported in the recent literature.

He reviews the different methods of avoiding these dangers. He formerly originated a method that is used a great deal, and has now further improved it.

ADAIR and SIEDENTOPF, Chicago.

SUPPLEMENT TO THE ARTICLE: THE ORIGIN OF INTRACRANIAL HEMORRHAGES IN THE NEW-BORN. J. K. KUHN, Ztschr. f. Geburtsh. u. Gynäk. **99**:548, 1931.

This article is only a short supplement to an article that was printed in a previous issue of the same journal.

ADAIR and SIEDENTOPF, Chicago.

BACTERIAL FLORA OF THE UPPER RESPIRATORY TRACT OF THE NEW-BORN (IN COMPARISON WITH THE ORAL FLORA OF MOTHER AND NURSE), WITH REFERENCE TO THE PROBLEM OF PNEUMONIA. M. GUNDEL and F. K. T. SCHWARZ, Ztschr. f. Hyg. u. Infektionskr. **113**:411, 1932.

The authors, on the basis of a large number of throat cultures, observed that within a few hours after birth, saprophytic organisms—Streptococcus anhaemolyticus, Micrococcus catarrhalis, Staphylococcus albus, colon bacilli—were easily obtained. With careful technic, pneumococci and influenza bacilli were isolated from a high percentage of infants, some as young as 2 days of age. The throat flora of the infants paralleled the throat flora of their mothers or nurses; the type of pneumococcus found in both was usually identical.

WOLMAN, Chicago.

Acute Infections

GOLD TRIBROMIDE (AURUM TRIBROMIDUM) IN THE TREATMENT OF PERTUSSIS. J. EPSTEIN, Arch. Pediat. **49**:1 (Jan.) 1932.

The author has made a study of the various antispasmodic and sedative drugs commonly used in the treatment of whooping cough. He finds that bromides give the best results. A special study has been made of these bromides in an attempt to prove which are most effective in the treatment of whooping cough. Of these various drugs, gold bromide appeared to be most useful in the treatment of this condition. The drug was administered by mouth, and the dosage varied with the age and weight of the child and the severity of the paroxysmal cough. As a general rule, from 1/20 to 1/10 grain (0.003 to 0.006 Gm.) three times a day was given. In a very few children 1/30 grain (0.002 Gm.) three times a day was sufficient to control the paroxysms. After two or three days' treatment the cough was noticeably less frequent and the attacks were shorter and milder. In two or three weeks the cough ceased entirely. There were no deaths and no complications in these series of treatments. The writer feels that the medicinal effect is probably due to a specific chemical reaction of gold with the tribromide radical.

WADDELL, University, Va.

ERYSIPELAS GANGRENOSA. SYDNEY NUSSBAUM, Arch. Pediat. **49**:17 (Jan.) 1932.

A case of erysipelas gangrenosa in an 11 year old child is reported and discussed. Features that differentiate the condition in this case from the usual form of erysipelas are a diffuse margin of rash, type alpha Streptococcus as the causative agent instead of the type beta, large deep ulcerations of the skin formed in the path of the rash and a low blood count.

WADDELL, University, Va.

FILTRABLE FORMS OF THE ROSENOW STREPTOCOCCUS FROM ANTERIOR POLIOMYELITIS. RUTH DEWEY RICHARDSON, J. Bact. **23**:29 (Jan.) 1932.

The author made an emulsion of the brains of rabbits succumbing to intracranial inoculations of the Rosenow poliomyelitis streptococcus and reinoculated this into fresh rabbits. The brains of these were emulsified and filtered through Berkefeld N filters. The filtrates in doses of 0.5 cc. intracranially were innocuous, despite the recovery of the original streptococcus from them by the Hauduroy serial transplant method on blood agar plates. The organisms appeared in from the fourth to the sixth transplant. Filtrates have also yielded positive results when the material filtered was recovered in fairly large amounts from the peritoneal cavities of rabbits inoculated with 20 cc. doses of the twenty-four hour brain-heart infusion broth culture of this streptococcus.

The author concludes that under certain conditions the Rosenow anterior poliomyelitis streptococcus is filtrable; but this fact in itself by no means proves that the filtrable phase is identical with the virus of poliomyelitis. Inoculations into monkeys are in progress.

STOESSER, Minneapolis.

THE PRESENT STATUS OF ANTERIOR POLIOMYELITIS. J. GROSSMAN, M. J. & Rec. **135**:32 (Jan. 6) 1932.

Acute anterior poliomyelitis is an acute general infection caused by an invisible filtrable micro-organism known as a virus. The virus has been found in the secretions of the nose and throat in persons with poliomyelitis and in well persons in contact with the sick. The disease is spread by personal contact. One attack of the disease, irrespective of its intensity, is protective for life. Many cases never show paralysis.

Patients in whom the diagnosis is made in the preparalytic stage can by means of convalescent serum pass through the disease without paralysis, and it is possible

after paralysis develops to prevent contractions by mechanical means. In the later stages one has at one's disposal means such as manipulation, tendon transplantation, tendon fixation, arthrodesis and various operations on the bones to correct paralysis and to improve the majority of the deformities.

WILLIAMSON, New Orleans.

CURRENT PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES. Pub. Health Rep. **47**:427 (Feb. 19) 1932.

For the period from Jan. 3 to 30, 1932, the incidence of influenza, poliomyelitis and scarlet fever was lower than in the corresponding period in 1931, while measles, diphtheria, meningitis, smallpox and typhoid were increased. The cases of measles reported were twice as numerous as in 1931. The mortality was 12.3 per thousand, the lowest for this period in seven years.

SANFORD, Chicago.

THE TREND OF SMALLPOX INCIDENCE IN CIVILIZED COUNTRIES. Pub. Health Rep. **47**:837 (April 8) 1932.

The League of Nations' report shows a marked decrease in smallpox in most European countries since 1920. The United States reports 46,712 cases in 1930; England, 11,839, and continental Europe, 268, of which 217 were in France. India reported 215,204 cases in 1930, with 48,860 deaths.

SANFORD, Chicago.

PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES. Pub. Health Rep. **47**:883 (April 15) 1932.

For the period of Feb. 28 to March 26, 1932, there were 11,000 more cases of influenza than in the preceding period. Measles and scarlet fever were increased, while diphtheria and meningitis were lessened. The average mortality was 13.5 per thousand cases.

SANFORD, Chicago.

UMBILICAL DIPHTHERIA. A. GORDON SIGNY, Arch. Dis. Childhood **7**:43 (Feb.) 1932.

This is a case report of umbilical diphtheria in an infant 17 days old. There was an inflammatory lesion around the umbilicus which underwent sloughing. Bacteriologic examination revealed the true character of the lesion.

KELLY, Milwaukee.

SCARLATINA. F. V. G. SCHOLES, M. J. Australia **2**:703 (Dec. 5) 1931.

In view of the fact that since the period from 1740 to 1880 there has been such a tremendous reduction in the case mortality rate of scarlatina in Australia, Great Britain and other European countries on the Atlantic seaboard (generally about 1 or 2 per cent at the present time), even though the case incidence remains undiminished, the questions naturally arise as to whether we are now taking the disease too seriously, and whether the continuance of expenditure of large amounts of public money on the isolation and treatment of scarlatinal patients is warranted. In spite of the fact that at any given time during the past two centuries scarlatina has been present in more or less malignant form in some part of the civilized world, such as that in Soviet Russia from 1925 to 1928, it has been fifty years since epidemics of malignant scarlatina have occurred in Australia, Britain and other Nordic countries. Moreover, during these fifty years the trend on the whole has been toward a lower and lower mortality. May it, then, be hoped that this signifies the fixing of an epidemic mild type of scarlatina, and possibly its ultimate disappearance?

A comparison of the various types of scarlatina as they occur in Australia today with those of sixty and seventy years ago shows that they are the same, but that the incidence of the severer forms today is insignificant as compared with that of the great epidemics of the last century. Acute fulminating forms, such as the so-called "toxic" and "septic" cases, are now rare, but they probably accounted for the majority of the deaths from scarlatina years ago. Should such cases reappear in epidemic form, dramatic results are to be expected from the early administration of antitoxic serum given intravenously in large doses.

In the old days many patients died in the later stages of the disease. These deaths took place from prolonged toxemia and prolonged sepsis, diphtheria, early and late nephritis, bronchopneumonia and septic meningitis following otitis. At the present time, toxemia or sepsis may be successfully combated by energetic antitoxin treatment, diphtheria by prophylaxis and antitoxic treatment and nephritis, bronchopneumonia and meningitis of otitic origin by better clinical care.

Contrary to the impression that scarlatina in the middle of the last century was almost invariably a very severe disease is the fact that mild and moderately severe forms occurred then as now, and this fact alone argues against undue optimism concerning the fixation of scarlatina as a minor ailment for all time to come.

The course of scarlatina may be divided into two periods. In the first period, the early administration of antitoxin results in rapid disappearance of the primary disease with rare exceptions. If the serum is not given early and the enanthema has been severe, local complications such as otitis media and cervical adenitis are to be expected, because of the extension of virulent streptococci through the raw surfaces of the upper respiratory tract left by desquamation of the enanthema. If the enanthema has not been severe, most children escape all complications at this stage. In children having enlarged and unhealthy tonsils and a history of recurrent attacks of tonsillitis, whether serum is given or not and whether the scarlatina is severe or mild, adenitis of a variable or recurrent character is to be expected.

The second period possesses no great significance for the majority of patients with scarlatina, but for the remainder it is a time not only of ill health but of actual danger. Severe tonsillitis, adenitis, rhinitis and otitis may appear in this period. In such cases these conditions may subside shortly or may pass into chronic rhinitis, adenitis and tonsillitis persisting over many weeks. Nephritis, when it makes its appearance, does so, as a rule, between the eighteenth and the twenty-third day, and is commonly accompanied by slight or moderate fever and swelling of the cervical lymph glands. True and typical scarlatinal rheumatism when it appears does so in the third week or later, and is also accompanied by fever, tonsillitis and adenitis. True "relapse," with angina, fever, enanthema and exanthem, may also develop in this period. All of these conditions of the second period are very common in children under 5, fairly common in children from 5 to 10 and uncommon in older children and adults.

All of the late manifestations may be regarded in the nature of a relapse, and may, in part, be explained by a consideration of two hypotheses: 1. Patients lose their antitoxic immunity, either wholly or in part, by the end of two or three weeks. Streptococci remain in the local foci of infection, and a complete or partial picture of the disease is shortly reproduced. 2. Patients are infected by fresh strains of streptococci, to which and to the toxins of which they have developed either no immunity or only a partial one.

Still another factor concerned with relapses which must be considered is the character of the tonsils, as trouble in late convalescence frequently occurs in children showing large, lumpy, pitted tonsils flaked with exudate, or soft, boggy, red masses exuding pus and little, hard, lumpy glands in the neck.

During the past five or six years these late manifestations, including classic relapse, have become much more common than they were during the preceding fifteen years. Another striking feature of present day scarlatina is that of the development, from the third to fourth week onward, of the state of chronic

infection, with persistent discharges and punctuated by minor inflammatory processes, the whole condition going on for weeks or months.

Judging by the writings of competent clinicians of the last century, this modern feature of chronic streptococcal infection did not exist in the nineteenth century. In explanation of this fact it may be said that: (1) the children whose condition now drifts into the chronic stage never would have had a chance in the days gone by because of the greater severity of scarlatina and the prevalence of diphtheria, measles, diarrhea, etc., and (2) with the decreasing toxicity of the streptococcus of the present time there has grown up a mutual tolerance between it and man.

Morals to be drawn from this review are: 1. Small children should be protected from infection in convalescence by fresh strains of cocci, by early discharge from contagious hospitals and by subsequent treatment and isolation at home. 2. When there is a prospect of this being done in the case of adults and older children, early administration of serum should be omitted and a small amount administered intramuscularly toward the end of the second week. 3. Tonsillectomy should be performed in selected cases at the earliest opportunity, possibly in the second week of the disease. 4. It should be kept in mind that, although it may appear that persons are gradually acquiring a general immunity to scarlatina, "He is a wise man who remembers the treacherous nature of scarlatina."

GONCE, Madison, Wis.

A STUDY OF BACTERIOPHAGE IN RELATION TO INFANTILE BACILLARY DYSENTERY. F. M. BURNET, M. MCKIE and I. J. WOOD, M. J. Australia **2**:714 (Dec. 5) 1931.

Therapeutic administration of a highly active polyvalent Flexner bacteriophage has no influence on the course of infantile dysentery.

GONCE, Madison, Wis.

BRILL'S DISEASE OR PSEUDO-TYPHUS. W. S. MCGILLIVRAY, M. J. Australia **2**:716 (Dec. 5) 1931.

Following a brief historical résumé and a description of the clinical characteristics of Brill's disease, the author gives the results of his bacteriologic studies of this disease. The serum of a patient with true typhus powerfully agglutinates a special strain of the proteus group of organisms, Bacillus proteus X; so does the serum of a patient with Brill's disease (Weil-Felix reaction). Many blood and stool cultures were made from patients suffering from Brill's disease with the hope of finding an organism which on injection into a rabbit would produce a serum that would give a positive Weil-Felix reaction. All such attempts were unsuccessful. However, cultures of sputum from a patient with the disease revealed a few odd colonies of gram-negative bacilli that grew as sticky films on solid mediums and that made liquid mediums very mucoid. This organism on injection into a rabbit gave a serum that strongly agglutinated B. proteus X 19. The author believes that this organism is the cause of Brill's disease. Details of cultural characteristics of the organism are given.

GONCE, Madison, Wis.

ENCEPHALITIS COMPLICATING WHOOPING COUGH IN A SYPHILITIC INFANT. W. MIKULOWSKI, Arch. de méd. d. enf. **35**:89 (Feb.) 1932.

A case is reported in a girl of 2 years, admitted to the Children's Hospital of Warsaw, suffering from generalized edema and a cough, with the provisional diagnosis of nephritis. Examination revealed pertussis, with aggravated edema of the face and body, in a poorly nourished child showing the characteristic stigmas of congenital syphilis. There was stupor, a staggering gait when walking was attempted and nystagmus; sugar was increased in the spinal fluid. The patient was discharged in thirty days to continue specific treatment in another pavilion. The writer discusses the differential diagnoses: first, general anasarca

from inanition and from edema of whooping cough and, next, encephalopathies and the difficulty of distinguishing readily between the toxic and the infectious types. In this instance the infection could arise from either encephalitic or syphilitic invasion.

AMESSE, Denver.

RECURRENCES AND RELAPSES IN INFECTIOUS DISEASES. JULES COMBY, Arch. de méd. d. enf. **35**:185 (April) 1932.

Among the acute infections of early life, there are some that may recur, such as influenza, diphtheria, pneumonia and erysipelas; there are others in which second attacks are not seen, or at least rarely occur, such as typhoid, epidemic cerebrospinal meningitis, acute poliomyelitis, whooping cough and mumps.

At a recent session of one of the older medical societies of Paris, Bourdelles raised the question of recurrence in measles and mumps among soldiers and made the astonishing statement that in 40 per cent of the cases of measles and in 14 per cent of the cases of mumps there were definite histories of previous invasions. Comby has challenged these figures, pointing out that the statements of young recruits on matters of this sort are undependable. The importance also of clearly separating recurrences from relapses is manifest. In reviewing his own vast experience Comby can find no instance of a recurrence of typhoid, although relapses are more common in typhoid than perhaps in any other infectious disorder; Alfonso reported an instance fifty days after apyrexia was established.

Smallpox is considered by certain writers as subject to recurrence, especially in patients suffering a benign attack; Comby has never encountered an instance. Likewise in chickenpox, during an active practice of fifty years, he has discovered no example of previous infection. With measles all authorities agree that reappearance, perhaps many years after the first invasion, is occasionally seen, but not to the extent implied in Bourdelles' report. In the case of rubeola, Comby would hesitate to declare that recurrences may not occur, but he maintains that he has noted no instance in either his hospital wards or his private clientele. For its rarity in secondary attacks and in relapses, scarlatina may be compared to measles; many years usually separate the infections. Mumps probably recurs in about 1 per cent, and whooping cough in a still smaller proportion of cases. Erythema nodosum, which may properly be classed among the eruptive fevers because of its well defined evolution, shows neither recessions nor recurrences.

Comby concludes his monograph with the frankly expressed opinion that actual reappearance in the acute infections is exceptional.

AMESSE, Denver.

LITTLE'S SYNDROME DUE TO A LESION OF THE CORPORA STRIATA FOLLOWING MEASLES. G. DEBBASCH, C. SPEZZAFUMO and A. SANTILLANA, Arch. de méd. d. enf. **35**:212 (April) 1932.

A female infant of 7 months, with negative personal and family histories, sustained a grave attack of measles. A short time afterward the mother noted rigidity of the upper and lower limbs, with athetosis. At the time of examination, when the patient was 26 months old, the usual clinical picture of Little's disease was present. The question naturally arose as to whether the disorder was congenital or acquired, pyramidal, extrapyramidal or mixed. In reviewing the literature it was found that similar instances have been reported as a sequel to measles by Henoch and by Signa. Anton described such a case following scarlatina, and various writers have recorded invasions of encephalitis in the wake of acute exanthems.

AMESSE, Denver.

CONVALESCENT SCARLET FEVER SERUM. R. DEBRÉ, Progrès méd., Nov. 17, 1931, p. 2023.

The author advocates the use of convalescent serum in malignant scarlet fever in doses of from 40 to 50 cc. intramuscularly, followed by from 30 to 40 cc. sub-

cutaneously. As a prophylactic, 20 cc. in infants and 30 cc. in the adult are indicated. Debré advocates the organization of some such scheme as is used in measles to pool convalescent scarlet fever serum and place it in ampules to use in appropriate cases.

SANFORD, Chicago.

THE ELECTRICAL REACTION IN POSTDIPHTHERITIC PARALYSIS. A. FIANO, Riv. di clin. pediat. **29**:997 (Nov.) 1931.

The author has determined the electrical reactions to galvanic and faradic current applied to the muscles of the lower extremities and to the peroneal, medial and facial nerves in twenty-three patients with postdiphtheritic paralysis of varying degrees of severity. The electrical stimulation of the facial nerve does not result in abnormal hyperexcitability, although mechanical stimulation does (positive Chvostek sign). Normal or almost normal values were found on stimulating the quadriceps femoris of these patients with galvanic current. This shows the absence of the myasthenic reaction.

HIGGINS, Boston.

VARIATION IN BLOOD CHOLESTEROL FROM IMMUNIZATION WITH ANTIDIPHTHERITIC ANATOXIN. RINA SIMONETTI, Riv. di clin. pediat. **29**:1048 (Nov.) 1931.

The author found the blood cholesterol to be high in twenty children recently recovered from diphtheria (in parts per thousand: average, 1.831; maximum, 2.666; minimum, 1.390). In twenty-two children who received immunizing doses of Ramon's anatoxin as prophylaxis against diphtheria, the cholesterol of the blood increased from an average of 1.193 parts per thousand (maximum, 1.738; minimum, 0.800) to 1.676 (maximum, 2.104; minimum, 1.332). The normal value of the blood cholesterol as given in the literature for children between 2 and 8 years is 1.35 parts per thousand.

HIGGINS, Boston.

CAN AN INJECTION OF DIPHTHERIA SERUM CALL FORTH A POSITIVE SERO-REACTION IN A NONSYPHILITIC PERSON? HARALD BOAS and GUDRUN TÖLBÖLL, Dermat. Wchnschr. **94**:173 (Jan. 30) 1932.

In one hundred patients with diphtheria, Wassermann and Kahn tests were performed before and after serum treatment. In one instance a positive reaction occurred one week after treatment, but it had cleared entirely six days later.

TAUSSIG, San Francisco. [ARCH. DERMAT. & SYPH.]

INTRACUTANEOUS VACCINATION. FELIX SCHLEINSER, Kinderärztl. Praxis **2**: 437 (Oct.) 1931.

The author is enthusiastic about intracutaneous vaccination against smallpox. It is simply performed, and there is a slight general reaction. Secondary infection is impossible, as is auto-reinoculation by the patient. One drop of pure vaccine virus is added to from 4 to 10 cc. of water (depending on the potency of the virus), and 0.1 cc. is injected intracutaneously.

HUENEKENS, Minneapolis.

THE TREATMENT OF SCARLET FEVER WITH SCARLET FEVER SERUM AND SYMBIOSE-SERUM. O. MELIKIAN, Kinderärztl. Praxis **2**:440 (Oct.) 1931.

The author gives an account of an epidemic of malignant scarlet fever in Northern Persia, in which a large proportion of the patients died within the first forty-eight hours. He treated twenty patients with injections of 20 cc. of scarlet fever antitoxin. All except one recovered, and few complications were noted. The patient who died did not receive the serum until the sixth day, while the others received it before the third day. Thirty patients were treated with symbiose-serum (diphtheritic-streptococcic antitoxin). This is serum taken from a horse

that has been inoculated with both diphtheria and scarlet fever. Of the thirty patients receiving 10 cc. of this combined serum, only one died. Cervical adenitis was the principal complication noted.

HUENEKENS, Minneapolis.

IMMUNIZATION AGAINST SCARLET FEVER. C. O. STALLYBRASS, Med. Klin. **27**: 1675 (Nov. 13) 1931.

The author reports his experience with immunization against scarlet fever in different institutions of the city of Liverpool. His results were encouraging, and he comes to the following conclusions: It is easily possible to immunize children in orphanages, schools and hospitals if the Dick toxin is used in those who give a positive reaction to the Dick test. The method is also reliable in suppressing the spread of an epidemic of scarlet fever. The process does not show any untoward effects in young children. As the disease usually occurs in more severe form in younger children, the immunization should be limited to this age group.

Combined and simultaneous immunization against scarlet fever and diphtheria is practicable and has not shown any disadvantages. It seems to be desirable that all children be immunized with the Dick toxin. But the experience is not wide enough to show whether the immunity lasts long enough to prevent reappearance of the epidemic in a community where such a procedure would be carried out.

ZENTAY, St. Louis.

CARRIERS OF DIPHTHERIA BACILLI. K. S. NANNINGA, Nederl. tijdschr. v. geneesk. **75**:5104 (Oct. 10) 1931.

The author obtained good results in the treatment of carriers of diphtheria bacilli with tannic acid. A strong solution was used, and the affected mucous membranes were carefully covered with this solution, which was rubbed in.

VAN CREVELD, Amsterdam, Holland.

EXANTHEMA SUBITUM. C. FREDERICKSEN, Ugesk. f. læger **94**:767 (Feb. 18) 1932.

Following a careful résumé of the literature since Zahorsky's article in 1913, "Roseola Infantilis," the author describes in detail fourteen cases of exanthema subitum observed during the last five years. The sudden onset, fever, appearance of exanthems on the third day following the drop in temperature, leukopenia with relative lymphocytosis, noncontagiousness of the disease and limitation of the age of the patient to the first year of life the author considers to be the main differential diagnostic points. He considers the exanthems an allergic reaction.

ELGHAMMER, Chicago.

Chronic Infections

EXAMINATION OF THE BLOOD AS AN AID IN THE DIAGNOSIS OF HILUM LYMPH-NODE TUBERCULOSIS. ELI FRIEDMAN, W. DAMESHEK and J. B. HAWES, JR., Am. Rev. Tuberc. **25**:24 (Jan.) 1932.

Examinations of the blood were made in thirty contact children who gave positive reactions to tuberculin, not any of whom were clinically ill. The white blood count, sedimentation rate, number of immature polymorphonuclear cells and monocyte-lymphocyte ratio were especially studied. Leukopenia was found in but one instance, in the only child showing evidence of clinical activity. The sedimentation rate was increased in five instances; an increase in immature polymorphonuclear cells ("band forms") occurred in three, and in five children there was an increase in the monocyte-lymphocyte ratio. Studies of the peripheral blood and of the sedimentation rate in suspected cases of tuberculosis of the hilar lymph nodes may prove to be of practical value. Correlated with a careful history, and with physical and roentgenologic examinations, observations on the blood may be of value in diagnosis as well as in prognosis.

SMITH, Ogden, Utah.

THE DYNAMIC BRONCHIAL TREE. CHARLES C. MACKLIN, Am. Rev. Tuberc. **25**:393 (March) 1932.

Early pathologic change in the mediastinum from infection of the lymphatic system has long been looked on as provocative of ill, but in this study the untoward effects were foreshadowed in the lung. It was found that normally the lung-root is flexible, and in respiration, particularly when forcible, it undergoes an up-and-down oscillation, in association with movement of the hilus and the parts below. In inspiration the hilus descends and moves outward and forward, giving opportunity for the posterosuperior regions of the lung to expand, and in expiration there is a reverse movement. If, however, the lung-root is stiffened from disease, this movement is crippled, and it is suggested that the region of lung above and behind the hilus is most affected. This points to a connection of the tuberculous process here with early limitation of root-movement, and it is urged that the normal range of movement, particularly in children, be standardized, and that this possible etiologic factor in tuberculosis be borne in mind by pathologists and others. Diagrams are used to illustrate these points. The normal inspiratory elongation of the bronchi, with widening, is figured, with the reverse expiratory phase in which there is shortening and narrowing. AUTHOR'S SUMMARY.

THE RELATIONSHIP OF THE SEROLOGY OF THE BLOOD TO THAT OF THE SPINAL FLUID IN CONGENITAL SYPHILIS. FRANK W. CREGOR, Arch. Dermat. & Syph. **24**:733 (Nov.) 1931.

The author examined the records of 7,000 cases in a state charity hospital, the patients ranging in age from birth to 15 years. Of these patients he found 180, or 2.5 per cent, to have syphilis. From this finding the interpretation is made that 2.5 per cent of the population of Indiana are afflicted with this disease.

The cerebrospinal fluid was examined in 103 of the 180 cases. A positive Wassermann reaction of the cerebrospinal fluid was obtained in 28 per cent of the cases. In 2.5 per cent of the cases in which the Wassermann test of the cerebrospinal fluid was positive, the Wassermann test of the blood was negative. The author does not state whether or not these patients were examined before the age at which the Wassermann test of the blood is likely to become positive. Though treated mothers may give birth to nonsyphilitic infants, they may also give birth to infants in whom the Wassermann test of the cerebrospinal fluid is positive and that of the blood negative and in whom positive reaction of the blood and signs of syphilis of the central nervous system usually develop before the age of 5 years.

Though the Wassermann reaction of the cerebrospinal fluid was positive in 28 per cent of all cases, a positive colloidal gold curve was obtained in only 18 per cent.

Fifteen of all patients had early syphilis, supposedly being the ones who survived after encountering the infection late in intra-uterine life, and 85 per cent of all patients had latent syphilis, presumably the result of latent or insufficiently treated syphilis in the mother.

The author believes that antibodies causing a positive Wassermann reaction may be transmitted to the child without transmission of the infection. The resulting condition in the child he calls syphilotoxemia.

HENNING, Iowa City.

A CASE OF TUBERCULOSIS IN AN INFANT OF SIXTEEN MONTHS OF AGE. MAY AGNESS HOPKINS, Dallas M. J. **18**:55 (April) 1932.

An infant had been treated at the clinic over a period of about one month for "teething" and a cold. When brought to the doctor the patient showed: temperature, 105.6 F.; respirations, 56, and pulse rate, 168. The abdomen was

distended, and there were symptoms of meningism. Examination revealed râles throughout the chest and a definite pus cavity in the apex of the right upper lung. As the bronchopneumonia had lasted over such a long period, tuberculosis was suspected, and the patient was sent to the hospital for a more accurate diagnosis. Examination of the blood showed: hemoglobin, 75 per cent; red cells, 3,000,000; white cells, 17,350, and polymorphonuclears, 79 per cent. The Wassermann test of the blood was negative. Spinal puncture showed fluid under pressure and cloudy, 107 cells, with 73 per cent polymorphonuclears and 27 per cent mononuclears, and traces of globulin. This specimen was cultured. Diagnosis by roentgenograms of the chest was "diffuse bronchial pneumonia, probably tuberculosis, with encapsulated pleurisy in the upper right chest." The culture of the spinal fluid was negative. Autopsy was not obtained.

SMITH, Sherman, Texas.

DISSOCIATION OF TUBERCLE BACILLI, PARTICULARLY B C G. G. B. REED, J. Bact. **23**:32 (Jan.) 1932.

Four strains of B C G, apparently avirulent and of R colony form when received, were cultured by the author for from one to three years in basic fluid mediums, mostly that of Proskeur and Beck. Originally, all grew as a thick folded pellicle with a tendency to separate into island-like masses. After from a few to many generations had been produced, all the strains began to show minute patches of finely granular pellicle. The addition of normal or anti-R rabbit serum or of emulsions of heat-killed R organisms to the synthetic fluid appeared to promote this development somewhat. Repeated subculturing from the fragments of veil to fresh fluids resulted in practically pure veil-like growths. Definite S colonies developed in plates made from the veil fragments on gentian violet egg in sharp contrast with the original R form. Both the veil and the S colonies produced in guinea-pigs generalized, progressive tuberculosis and death within short periods. Tuberculous tissues of advanced cases or of dead animals frequently showed very large numbers of bacilli; cultures were repeatedly obtained, and in guinea-pigs given injections of exudates or macerated tissues progressive, fatal disease developed. The S forms resembled other virulent S types.

The author states that B C G from the four strains examined appeared to be a highly stable R form of the tubercle bacillus, which may, however, under appropriate cultural procedure continued over a sufficiently long period, dissociate into virulent S forms.

STOESSER, Minneapolis.

BONE AND JOINT TUBERCULOSIS IN CHILDREN. THEODORE TOEPEL, J. M. A. Georgia **20**:417 (Nov.) 1931.

Toepel eloquently discusses the virtues of sunshine combined with suitable appliances and occupational therapy. Lantern slide illustrations demonstrate the methods of immobilization employed and the results in three cases.

KISER, JR., Atlanta, Ga.

THE EARLY DIAGNOSIS OF TUBERCULOSIS IN CHILDREN: REPORT OF 294 INTRADERMAL TUBERCULIN TESTS. T. IRVIN WILLINGHAM, J. M. A. Georgia **20**:463 (Dec.) 1931.

After acknowledging the importance of the patient's history, physical examination and roentgenogram in diagnosis, the author discusses the value of the tuberculin test. Results of the test on 294 children are given. The children were between the ages of 6 and 12 years and were examined in the Tuberculosis Clinic, the majority of the patients coming from tuberculous homes. The incidence of positive tests was 40 per cent for those with a definite history of exposure, 11 per cent for those with no history of exposure and 32 per cent for the total group.

KISER, JR., Atlanta, Ga.

LEPROSY IN A CHILD. I. N. KUGELMASS, New York State J. Med. **32**:68 (Jan. 15) 1932.

A 10 year old girl was admitted to the Fifth Avenue Hospital two weeks after her arrival from Porto Rico. The child was in good physical condition except for the cutaneous condition. For three months a patchy, erythematous rash had been present over the trunk, buttocks and extremities, and thickening of the fingers had been noticed. A generalized maculopapular eruption was especially profuse over the buttocks and lower extremities. The macules were dry, smooth and shiny. They were yellowish in the center and bright red at the border. Several round nodules varying in size from that of a small shot to that of a filbert were present over the lower extremities. Both these and the macules were anesthetic to the touch of a pin.

The Kahn and Wassermann reactions were negative. Biopsy failed to show lepra bacilli, but the pathologic findings were characteristic of leprosy. The patient was seen in consultation by Dr. Howard Fox.

AIKMAN, ROCHESTER, N. Y.

BENIGN TUBERCULOUS INFILTRATION OF THE LUNG (EPITUBERCULOSIS). J. C. SPENCE, Arch. Dis. Childhood **7**:1 (Feb.) 1932.

Three children clinically resembling tuberculous patients are described; each presented a massive benign lesion of the lung. The lesions lasted a year or longer and disappeared without cavitation, fibrosis or bronchiectasis. There were relatively slight symptoms of illness. The results of tuberculin cutaneous tests were positive. In one patient tubercle bacilli were found in the material obtained from the needle following exploratory puncture.

KELLY, Milwaukee.

THE DETECTION OF PRESYMPTOMATIC TUBERCULOSIS IN CHILDREN. ERNEST FLETCHER, Lancet **1**:444 (Feb. 27) 1932.

Fifty children were selected from the Marylebone General Dispensary, who, although they had in the past attended the dispensary for various ailments, were healthy at the time of the examination, so far as they or their parents knew. All except four were between the ages of 5 and 12 years.

Among the fifty, four cases of "latent tuberculosis" (tuberculosis of childhood) were found, four of enlarged tracheobronchial glands and five of nontuberculous fibrosis.

The tuberculin test (Mantoux) gave the following results: In four cases of tuberculosis of childhood the test was ++ in one, + in two and — in one; in four cases of enlarged lymph glands, the test was + in two, — in one and not done in one.

"It is concluded, so far as it can be from such a small number, that the tuberculin test is no guide in a sufficiently important group of cases. . . . The shape and extent of the lesion by radiography, is apparently no guide to its severity, nor any indication of its prognosis."

LANGMANN, New York.

THE VALUE OF TUBERCULIN TESTS IN MAN. P. D'ARCY HART, Medical Research Council, Report no. 164, 1932.

The author reports observations on 1,030 clinically tuberculous patients. The conclusions are that the intracutaneous method for the tuberculin test is the most satisfactory and should replace the subcutaneous and cutaneous methods. A positive response in infancy suggests that clinical tuberculosis is, or soon will be present. In a child aged from 2 to 5 years who shows symptoms, a positive reaction suggests that these symptoms are tuberculous. In patients over 5 years the value of a positive test is limited to observations made intracutaneously, and the test is not recommended for routine practice. Conclusions drawn from a negative Pirquet test, owing to the relative insensitiveness of this method, must

be drawn with caution. A negative reaction to tuberculin obtained by the intracutaneous method excludes clinical tuberculosis with a small error. This applies to patients of all ages. The author pleads for a uniform technic and a tuberculin of known potency.

SANFORD, Chicago.

REPORT OF A CASE OF SUBCUTANEOUS VACCINATION WITH B C G. P. MARTINEZ GARCIA, Arch. de méd. d. enf. **35**:141 (March) 1932.

Review of the results obtained in different clinics through the employment of B C G in the prophylaxis of tuberculosis has given rise to a new series of interpretations and to the revision of others believed until recently to have been established on a sound basis.

The case against the use of this well established preventive agent has not always been presented in an unprejudiced spirit: Numerous failures have been reported in cases in which incomplete histories and faulty technic were obvious or in which faulty interpretation has led the observers to inexact conclusions. In evaluation of the various methods of diagnosis, for example, the states of tuberculous allergy and anergy must be given careful consideration if the practice of vaccination and revaccination is to rest on a scientific foundation. The author criticizes a paper recently offered by Jaso of Madrid, reporting a fatal case of tuberculosis in an infant vaccinated with B C G by the subcutaneous method, in which he believes a benign infection was exalted by the use of the specific medicament.

AMESSE, Denver.

TWO CASES OF STREPTOCOCCUS INFECTION IN THE COURSE OF OSSEOUS TUBERCULOSIS. M. GALLAND, Bull. et mém. Soc. de. chir. de Paris **23**:618 (Nov. 20) 1931.

Galland has observed two cases of streptococcus infection during the course of osseous tuberculosis in children. The first occurred in a child of 12 years, with coxalgia, in whom an abscess in the region of Hunter's canal became infected following mastoiditis for which operation was performed. No incision was made, but cure followed repeated punctures. The second case was one of paracoxalgia in a child of 5 years, with streptococcus osteomyelitis in the pubic region. An incision was made, followed by rapid amelioration of symptoms. A sequestrum was thrown out several months later. Raiga believes that more rapid cure might have been effected in the first case by the use of bacteriophage. In the second case, in which the rapid recovery following a simple incision suggests a staphylococcus infection, he thinks that the streptococcus isolated from the pus may have been a staphylococcus in a state of mutation.

BIEKER, St. Petersburg, Fla.

DIAGNOSTIC VALUE OF BLOOD CULTURE IN TUBERCULOSIS. A. LAENZ, Compt. rend. Soc. de biol. **107**:1455 (Sept. 18) 1931.

The method of Löwenstein was used to determine the presence of acid-fast bacilli in the bloods of tuberculous persons. The method is described in some detail. Löwenstein had found the bacilli present in the great majority of specimens examined, but the author was able to find only eighteen positive growths in three hundred specimens from patients of numerous clinics. Laenz is not particularly impressed with the Löwenstein method so far as the diagnosis of clinical tuberculosis is concerned, and feels that it is only of laboratory interest.

WAHL, Cleveland.

COMMON ALLERGIC REACTIONS FOLLOWING TUBERCULOUS AND PSEUDOTUBERCULOUS INJECTIONS. P. BORDET, Compt. rend. Soc. de biol. **107**:1465 (Sept. 18) 1931.

Previously Bordet has shown that suspensions of killed Bacillus coli produced necrosis and hemorrhage in tuberculous guinea-pigs at the site of the subcutane-

ous injection, and, if given intramuscularly, hemorrhagic infiltration about the tuberculous foci were seen post mortem.

A pseudotuberculous condition is produced by injecting from 0.005 to 0.0005 cc. of a twenty-four hour bouillon culture of the "virus of Malassez" into the plantar surface. A local abscess with involvement of the popliteal glands forms; the infection spreads rapidly, forming abscesses in the liver and spleen, and death occurs in ten days; however, some animals survive three weeks. Five days after the injection of the pseudotuberculous virus, a subcutaneous injection of B. coli produces a typical reaction of the skin as is seen in allergic tuberculous animals. The reaction is purpuric, and demarcated from the white skin; in two days, there is tenderness and a vesicle forms; later a crust and then ulceration occur, with scar formation at about two weeks.

A similar reaction is produced by B. vulgaris. Staphylococcus is inactive. B. proteus of intestinal origin given intravenously produces the same reaction as B. coli in tuberculous guinea-pigs.

The authors ask why the hypersensitivity for B. coli and B. proteus, which appear normally in the intestinal tract, is present at the site of the tuberculous injection. The reaction is the same as that which occurs in infections of the intestinal tracts of these animals, as shown by congestion and analogous hemorrhage in the intestinal tracts which occur when the proteotoxin of these organisms is injected intravenously.

WAHL, Cleveland.

THE MENTAL ASPECTS OF CONGENITAL SYPHILIS. M. PINARD, Paris méd. **1**: 205 (March 5) 1932.

The author stresses the necessity for active treatment and prophylaxis of congenital syphilis on account of the mental development. The patient with congenital syphilis shows morbid jealousy and has a criminal tendency.

SANFORD, Chicago.

BUCCAL EXAMINATION IN CONGENITAL SYPHILIS. M. HISSAID, Paris méd. **1**: 216 (March 5) 1932.

The systematic examination of the buccal cavity is as important as that of any system. The major stigma is Hutchinson's teeth. Minor ones are interstitial cicatrix of the gums, mucous patches on the tongue or cheeks and modifications in the dental structure, such as faulty alinement and Carabelli tubercles.

SANFORD, Chicago.

THE SYNDROME OF REGRESSIVE PERIFOCAL TUBERCULOUS PROCESSES: THE POSSIBILITY OF CURE IN CHILDREN. PEDRO CANTONNET BLANCH, Arch. de pediat. del Uruguay **2**:317 (July) 1931.

The author reports nine cases in children ranging in age from 2 to 8 years showing the condition generally described as epituberculosis. In all cases there were tuberculous antecedents with active tuberculosis. All the children gave positive tuberculin reactions. In a few the bacillus of Koch was demonstrated. Roentgen examination showed extensive pulmonary lesions, usually around some primary focus. Not all the cases showed progressive regression of the lesions under treatment. There were occasional relapses, with increase of shadows and densities as demonstrated by roentgenograms. Physical and general improvement often precedes the diminution or complete disappearance of roentgen indications by many months. The prognosis is generally good, but the case must be carefully watched and the treatment continually supervised. The patient must be immediately removed from the contaminating environment. Open air treatment, heliotherapy and proper dietetic management usually result in complete cure.

SCHLUTZ, Chicago.

CULTURE OF TUBERLE BACILLI FROM THE BLOOD. K. BINGOLD and W. SPIER, München. med. Wchnschr. **78**:1899 (Nov. 6) 1931.

The authors attempted to repeat the work of Löwenstein, who reported the successful culture of tubercle bacilli in cases of acute polyarthritis and in various types of tuberculosis. No tubercle bacilli could be demonstrated in cultures of the blood in ten patients with acute polyarthritis. The blood of patients with pulmonary tuberculosis, complicated by either genito-urinary, laryngeal or intestinal lesions, was also examined for tubercle bacilli. All the cultures were negative. The technic for cultivating the bacilli described by Löwenstein was followed as carefully as possible.

BRAHDY, Mount Vernon, N. Y.

TUBERCLE BACILLEMIA IN TUBERCULOSIS OF THE SKIN. P. KALLÓS, München. med. Wchnschr. **78**:1901 (Nov. 6) 1931.

Kallós was unable to confirm the work of Löwenstein, who cultivated tubercle bacilli from the blood of patients with tuberculosis of the skin. Kallós found that the Löwenstein medium was suitable for the culture of tubercle bacilli; however, tubercle bacilli could not be demonstrated in thirty-seven cultures of the blood of twenty patients with tuberculosis of the skin.

BRAHDY, Mount Vernon, N. Y.

AGRANULOCYTOSIS FOLLOWING TREATMENT WITH NEOARSPHENAMINE. E. E. ESSENFELD, München. med. Wchnschr. **78**:2034 (Nov. 27) 1931.

Essenfeld reports two cases of syphilis in which fatal agranulocytosis developed following treatment with neoarsphenamine. In the first case the symptoms appeared one week after the thirteenth injection; in the second case symptoms appeared immediately after the twelfth injection. Neither patient had icterus, but both had thrombocytopenia with evidence of hemorrhage.

BRAHDY, Mount Vernon, N. Y.

POSTMORTEM OBSERVATIONS ON INFANTS WHO DIED IN LÜBECK AFTER IMMUNIZATION AGAINST TUBERCULOSIS. P. SCHUERMANN, Verhandl. d. deutsch. path. Gesellsch. **26**:265, 1931.

The anatomic examination of fifty infants post mortem revealed that as a result of oral infection primary tuberculous lesions may be present in any organ that can be reached from the mouth. Only in eleven infants was the primary lesion found in a single organ, the small intestine, while in all the others primary lesions were present at the same time in two or more organs (small intestine, region of the neck, middle portion of the digestive tract, lung). Except in the small intestine, the primary lesion was found most frequently in the tonsils and in the middle ear. As infections in unusual locations were observed: primary tuberculosis of the duodenum, stomach and esophagus and apparently secondary tuberculosis of the larynx and of a dental follicle. The duration of the disease in the fifty infants varied between nine and thirty-four weeks. The causes of death were meningitis, inanition, intestinal obstruction and some rarer complications. Not infrequently, a nonspecific acute or subacute interstitial hepatitis was observed.

HELLWIG, Witchita, Kan. [ARCH. PATH.]

FURTHER STUDIES OF THE DISASTER IN LÜBECK. B. LANGE, Ztschr. f. Tuberk. **62**:335, 1931.

At the time when the first death occurred following the B C G vaccination in Lübeck, a strain marked B C G 143 was present in the Lübeck laboratory. Careful tests for virulence made it quite certain that this strain was not one of B C G but a strain of a human tubercle bacillus of very low virulence for guinea-pigs. So far all evidence points to the assumption that pure B C G is unlikely

to undergo sudden increases in virulence. Statements to the contrary are based on experimental work which so far is lacking confirmation. Although other workers were able to derive morphologically different colonies from B C G, Petroff's contention that the S form is virulent has not been confirmed. It is concluded again that disease and death were caused in the vaccinated children because a pathogenic tubercle bacillus other than B C G had been administered. Since in vaccines a tubercle bacillus of low virulence was demonstrated, and since a tubercle bacillus of similar behavior was isolated from the diseased children this statement seems well founded, especially since atypical strains of such low and labile virulence for guinea-pigs are quite rare.

PINNER, Tucson, Ariz. [ARCH. PATH.]

TUBERCULOSIS IN THE FIRST THREE YEARS OF LIFE. J. OSTENFELD and R. KJER-PETERSEN, Ztschr. f. Tuberk. **62**:369, 1931.

A total of 260 families in each of which at least one member had proved open tuberculosis, and which had been observed during the years from 1919 to 1925, were studied in regard to the fate of children born in these families. A total of 245 children were available for the study. Of these 245 children, 19, or 7.8 per cent, died. In 12, the cause of death was undoubtedly tuberculosis. This percentage is far below the 25 or 30 per cent which is claimed by Calmette. From 1908 to 1925, 295 children were known to the dispensaries in Copenhagen to have had a positive Pirquet test within the first three years of life. In 1930, 293 of these children could be traced. Of 53 children who had a positive reaction during the first year of life, 33 were alive after at least 5 years. Of 91 children with a positive Pirquet in the second year of life, 77 were living, and of 149 children with a positive Pirquet in the third year of life, 134 were living. Of all children who had died, only 6 had died after the age of 5 and only one of these had died of tuberculosis. It is concluded that a positive Pirquet test even in the first two years of life does not necessarily indicate active disease.

PINNER, Tucson, Ariz. [ARCH. PATH.]

THE TREATMENT OF INFANTS BY CALMETTE'S VACCINE. P. DRUCKER, Acta obst. et gynec. Scandinav. **11**:403, 1931.

The author has studied cases from the Rigshospital, Copenhagen, in which newly born infants were vaccinated perorally by the Calmette method. There were forty-nine children from tuberculous homes, in nineteen of which there was open tuberculosis. In 1927, sixteen infants were vaccinated; in 1928, eight; in 1929, twenty-two, and up to May, 1930, four. Four infants (8 per cent) died of non-tuberculous diseases during the first year of life, and twelve had various predominantly catarrhal diseases. Neither the histories nor the physical examinations gave any evidence of injury resulting from the vaccination. In one child, B C G was found in flushing the gastric ventricle; there were no other pathologic signs in this infant. There was no evidence that any of the infants were infected with human tuberculosis, except for a positive tuberculin reaction. Forty cases showed no evidence of pulmonary tuberculosis on roentgen examination. Ventricular flushing in thirty-five cases showed no evidence of tubercle bacilli. Vaccination appears to provide a certain immunity. Forty-three infants were tested with Pirquet's and Mantoux's tests, and allergy was present in 95 per cent. Allergy was found in only 52 per cent with the Pirquet test alone. Allergy seems capable of lasting three years.

ADAIR, Chicago.

TUBERCULOSIS IN BABIES. C. DE LANGE and M. DE BRUIN, Nederl. tijdschr. v. geneesk. **75**:4528 (Sept. 5) 1931.

This is an extensive discussion of the clinical appearance of tuberculosis in babies. The various clinical, roentgen and pathologico-anatomic pictures are

stressed and illustrated by a number of cases. Five cases in children who were given Calmette's vaccine perorally during the first ten days of life and who could be observed clinically are especially discussed.

VAN CREVELD, Amsterdam, Holland.

A CASE OF TUBERCULOUS MENINGITIS. P. VAN HASSELT, Nederl. tijdschr. v. geneesk. **75**:4559 (Sept. 5) 1931.

A boy of 9 years fell suddenly ill with symptoms of meningitis. The spinal fluid, which was under pressure, showed tubercle bacilli and some lymphocytes; the Nonne test was negative. Two days later distinct symptoms of pneumonia were present. No tubercle bacilli could be found in the sputum. The meningeal symptoms soon disappeared and after two weeks those of pneumonia did also. About four months later the boy was in perfect condition.

VAN CREVELD, Amsterdam, Holland.

Internal Diseases

XANTHOMATOSIS. (SCHÜLLER'S DISEASE; CHRISTIAN'S SYNDROME): REPORT OF THREE CASES TREATED WITH ROENTGEN RAYS. MERRILL C. SOSMAN, Am. J. Roentgenol. **23**:581 (June) 1930.

The term xanthomatosis was coined by Rowland for a group of diseases in which the lipoid metabolism is at fault and includes the syndrome known as defects in the membranous bones, diabetes insipidus and exophthalmos; Gaucher's disease; Niemann-Pick's disease, and the various forms of xanthoma, xanthomyeloma and xanthelasma. An important diagnostic point is the evidence of osseous defects in the roentgenograms of the skull or pelvis or both. The treatment, prognosis and etiology are discussed. In the three cases reported, two patients are boys of 2½ and 4½ years of age. This disease is presumably due to a disordered metabolism of fats, but its primary cause is unknown. Regulation of diet did not cause any reparative changes in the cranial defects in two of these cases. Insulin was similarly of no help in one case. All the patients were benefited by roentgen treatment, and the defects in the skull underwent healing changes in each case. Twenty-three cases, all told, have been collected up to the time of this report.

STULIK, Chicago.

CONGENITAL ANEMIAS, ROENTGENOLOGICALLY CONSIDERED. EDWARD C. VOGT and LOUIS K. DIAMOND, Am. J. Roentgenol. **23**:625 (June) 1930.

Nineteen cases of severe anemia with distinctive changes in the bones are reported. Of these, five were of congenital hemolytic anemia (or congenital hemolytic jaundice), one of sickle cell anemia and thirteen of erythroblastic anemia. The common factor in each of these conditions is hyperactivity of the bone marrow tissue. This may be considered either as a physiologic response of the tissue to the need for blood or as a primary pathologic process producing large numbers of abnormal erythrocytes; this applies especially to erythroblastic anemia. The bone marrow, liver and spleen in this disease show overcrowding with erythrogenic centers just as the same organs in leukemia are involved in abnormal production of immature leukocytes. The well known changes in the bones of erythroblastic anemia are described.

STULIK, Chicago.

CHLOROSIS WITH HYPERTENSION: REPORT OF THREE CONSECUTIVE CASES. HAROLD C. TOOKER, Arch. Pediat. **49**:91 (Feb.) 1932.

Three cases of chlorotic anemia with hypertension occurring at puberty are reported. Attention is called to the scarcity in the literature of allusions to hypertension associated with anemias. The anemia was cured in the usual way,

by means of iron compounds, hygiene and regulation of diet. The associated functional hypertension was treated with glandular extracts, a combination of thyroid and pancreas being used.

WADDELL, University, Va.

COARCTATION OF THE AORTA ASSOCIATED WITH RHEUMATIC INFECTION AND ANEURYSM OF THE INNOMINATE ARTERY. JOSEPH B. WOLFFE, Arch. Pediat. **49**:100 (Feb.) 1932.

The author's summary is as follows: "A case of coarctation of the aorta, complicated by the development of an aneurysm of the innominate artery caused by a rheumatic infection, is reported. Both coarctation of the aorta and aneurysm on a rheumatic basis are rare. We feel that the evidence is sufficient for the diagnosis of aneurysm developing in a vessel subjected to a high pressure and involved in a rheumatic process."

WADDELL, University, Va.

CONTROL AND TREATMENT OF GONORRHEAL VAGINITIS OF INFANTS. J. HUBERT VON POURTALES, Arch. Pediat. **49**:121 (Feb.) 1932.

The recognition and segregation of patients with latent or chronic gonorrheal vaginitis is important in the prevention of epidemics in institutions. Unless smears are taken directly from the cervix chronic cases will be overlooked. In the writer's study of over three hundred cases the number of positive chronic cases was at all times greater than the number of acute cases, which bears out the theory of the chronicity of this disease. Such cases are a potential source of infection, and the great importance of segregation of the patients is apparent. Effective laundering of diapers, preferably under laboratory supervision, is the best means of preventing new cases.

All linen coming from wards for patients with gonorrheal vaginitis is collected in canvas bags which are washed along with their contents in a 2 per cent solution of compound solution of cresol for twenty minutes at a temperature of 230 F. The writer adopted this procedure after a series of various forms of sterilization and washing. He found that ordinary washing of diapers, as done in hospitals or asylums, failed to destroy the gonococcus and that when cultured they still produced positive cultures. The numerous methods of treatment employed proved disappointing in their results, and the writer concludes that effective sanitary measures without any medical treatment has been the source of his apparent success in controlling gonorrheal vaginitis at his institution.

During the first year's observation not one patient returned for further treatment. Of all discharged patients, 92 per cent gave negative gonorrheal fixation results within seven months after the disappearance of the clinical symptoms.

WADDELL, University, Va.

MUCOUS COLITIS: REPORT OF A MORIBUND CASE OF ACIDOSIS FOLLOWING COLITIS OF THREE MONTHS' STANDING. M. M. MCCORD, Arch. Pediat. **49**: 126 (Feb.) 1932.

The author reports the case of a moribund patient with mucous colitis of three months' standing which responded promptly to intraperitoneal infusions and a suitable dietary regimen. The writer emphasizes the importance of proper feeding in cases of colitis, especially when there has been a prolonged convalescent period.

WADDELL, University, Va.

HEMORRHAGIC THROMBOCYTOPENIA IN CHILDHOOD. STAFFORD MCLEAN, KATHERINE KREIDEL and JOHN CAFFEY, J. A. M. A. **98**:387 (Jan. 20) 1932.

Twenty-one cases are reviewed. The term hemorrhagic thrombocytopenia is preferred to purpura hemorrhagica or thrombocytopenic purpura because purpuric manifestations are frequently the least important of the hemorrhagic features.

Infection frequently precedes the disease. Minor fluctuations of the platelet count when it is at a pathologic level are insignificant, and should not indicate a relapse or be used to indicate splenectomy. Clinical evidences of hemorrhagic activity are the most valuable guides in prognosis or as an indication for splenectomy. Spontaneous remissions occur in many cases, and they are often accelerated by transmission. Splenectomy causes the most rapid remission, is not always successful and is dangerous. It should be reserved for patients with fulminating uncontrollable hemorrhage and those with chronic hemorrhage interfering with growth and development or handicapping the well-being of the patient. The diagnosis in the cases reported rested on clinical evidence of hemorrhage, a low platelet count, a prolonged bleeding time and delayed retraction of the clot.

BONAR, Salt Lake City.

LIPODYSTROPHY: REPORT OF SIX CASES IN CHILDREN. ARTHUR H. PARMELEE, J. A. M. A. **98**:548 (Feb. 13) 1932.

The author reports six cases of lipodystrophy in children, in all of whom the loss of subcutaneous fat was noticed for the first time soon after a definite and severe infection of the upper respiratory tract or following tonsillectomy. There was no laboratory or clinical evidence of endocrine disturbance. It is possible that toxic or infectious derangement of the central trophic centers in the thalamic and subthalamic areas of the midbrain may be an etiologic factor. The disease is characterized by onset, at about the age of 6 years, of loss of subcutaneous fat of the face, neck, thorax, arms and abdomen, associated in girls with an increase of subcutaneous fat below the iliac crests. Gross symptoms of ill health are absent.

BONAR, Salt Lake City.

MELORHEOSTOSIS LÉRI: A FLOWING HYPEROSTOSIS OF A SINGLE EXTREMITY. E. KRAFT, J. A. M. A. **98**:705 (Feb. 27) 1932.

The condition consists of a hyperplastic lesion of the bone which is confined to a single extremity, extending from one end to the other in a linear track, usually leaving a few unaffected areas along the course. Pathologically it is characterized by proliferation of ivory-like new bone in the cortical areas. The vague symptoms that are first found in childhood or adolescence consist of pain, transitory stiffness and limitation of motion of joints and occasionally permanent ankylosis. The etiology is obscure, and the treatment is symptomatic. Spontaneous remission of symptoms is characteristic.

BONAR, Salt Lake City.

THE VALUE OF LIVER EXTRACT AND IRON IN THE ANEMIA OF YOUNG INFANTS. S. MAURER, J. GREENGARD and C. KLUVER, J. A. M. A. **98**:1069 (March 26) 1932.

Anemias of early infancy have been controlled by the administration of liver extract and iron compound's that contain traces of copper. Administration of iron compounds with traces of copper failed to bring about improvement in 50 per cent of cases, and liver alone failed in 37 per cent. In infants in whom failure resulted when one of the ingredients was omitted, improvement occurred when the missing elements were added.

BONAR, Salt Lake City.

DIABETIC COMA. E. P. JOSLIN, H. F. ROOT, P. WHITE, W. R. JORDAN and H. M. Hunt, M. Clin. North America **15**:829 (Jan.) 1932.

In a comprehensive discussion of diabetic coma in general, the authors report seventy cases occurring in children under the age of 15 years, of whom sixty-nine recovered. Owing to more frequent dietary lapses and greater susceptibility to infections, this complication occurs more frequently in the child than in the adult. The onset may be sudden, but is usually insidious over a period of several days.

It is usually preceded by vague symptoms, such as nausea, malaise and pains in the legs. Abdominal pain is of frequent occurrence and may closely simulate an acute condition requiring surgical intervention. Conversely, an acute intra-abdominal inflammation may be the exciting cause of the coma. Polyuria and polydipsia are increased. Nausea and vomiting are the most reliable of the warning symptoms, and when they occur in a diabetic child, always require a physician's attendance. Hyperpnea is the most certain sign of coma in childhood, and when occurring typically means acidosis. So valuable an indication is the character of the breathing that in small children, in whom there may be some hesitation in making frequent venipunctures, it may be relied on as a guide to the dosage and frequency of administration of insulin. Drowsiness and coma appear late in children, and are often preceded by a state of excitement. Morphine should never be used, since it masks the progress of the coma. Circulatory collapse, common in adults, is exceptional in the child. Coma in the diabetic child is most likely to be confused with insulin shock. The most important clinical signs in the differential diagnosis are: 1. Loss of consciousness is rapid in insulin shock and gradual in coma. 2. Increase of dosage of insulin, reduction of diet or increased exercise favors the development of shock; omission of insulin, dietary lapse or infection cause coma. 3. The skin in insulin shock is moist and pale; in coma it is dry and flushed until the late stages. 4. Breathing is normal or shallow in shock; there is hyperpnea in coma. 5. The pulse in shock is full and bounding; in coma it is weak and rapid. 6. Vomiting is exceptional in shock, it occurs regularly in coma and precedes unconsciousness. 7. Convulsions are the rule in shock; they occur in coma but almost invariably only when the patient has received alkalis. Success in treatment depends on the promptness with which the patient is given adequate doses of insulin. To a child who has not had insulin, the dose is from 5 to 10 units every half hour. Larger doses should be given to patients with long-standing cases. The average dose given in the first twenty-four hours in this series was 145 units (minimum 32 and maximum 840 units). Physiologic solution of sodium chloride must be used freely, subcutaneously or intravenously, in sufficient amount to overcome dehydration. Repeated gastric lavage and enemas are used to combat lack of gastro-intestinal tone.

SMITH, Ogden, Utah.

BACTERIOPHAGES AS A HELP IN THE TREATMENT OF INFECTIONS IN CHILDREN. W. J. MACNEAL, New York State J. Med. **31**:1383 (Nov. 15) 1931.

The theory and development of bacteriophagia are clearly described. The best results from this method of treatment are obtained in dysentery and other entero-colic infections. Good results have also been obtained in pyelitis. This method has been successfully used in thrombophlebitis and osteomyelitis. In the treatment of furuncles and carbuncles of the skin bacteriophagia is of value. The author's results in the treatment of septicemia in children have not been satisfactory.

AIKMAN, Rochester, N. Y.

SATURNINE RENAL DWARFISM. L. J. JARVIS NYE, M. J. Australia **2**:813 (Dec. 26) 1931.

From a study of twenty-two patients who had severe plumbism in early childhood, the author believes that chronic lead poisoning in early life frequently results in dwarfism and chronic nephritis. Except for the dwarfism and the signs of chronic interstitial nephritis these saturnine renal dwarfs differ from patients with renal rickets in that they show all the signs of generalized vascular sclerosis with raised blood pressure and cardiac hypertrophy, normal mentality, normal secondary sexual characteristics and no gross bony changes. The question as to whether the renal factor or some other toxic effect of lead is responsible for the inhibition of growth in these cases of saturnine renal dwarfism is briefly discussed by the author without any definite conclusion being reached. The histories of five cases are presented.

GONCE, Madison, Wis.

FAMILIAL MULTIPLE EXOSTOSES. L. BABONNEIX and A. MIGET, Bull. Soc. de pédiat. de Paris **29**:370 (July) 1931.

A boy, 20 months old, showed multiple exostoses. These were first noted at the age of 2 months, and they had become progressively larger and more numerous. The child was otherwise normal. The father, 30 years old, showed a similar condition which first made its appearance when he was 6 years old. The father's maternal grandmother had some deformities, but the nature of these could not be ascertained.

BENJAMIN, Montreal, Canada.

SYNDROME OF HYPERTROPHIC PYLORIC STENOSIS. PYLOROTOMY. EVISCERATION ON THE FIFTH DAY. CURE. H. L. ROCHER, Bull. Soc. de pédiat. de Paris **29**:385 (July) 1931.

A girl, 3 months old, presented the typical picture of congenital hypertrophic pyloric stenosis, namely, persistent projectile vomiting, constipation and failure to gain weight. Roentgen examination showed marked gastric retention after twelve hours. At operation the pylorus was found to be normal in size, and pylorotomy was done with great care. On the fifth postoperative day the abdominal incision opened and evisceration took place; the intestinal coils were replaced in the abdomen, and the wound was closed in layers and a tight strapping applied. After this the infant made an uninterrupted recovery. When such marked pylorospasm exists as to be uncontrollable by medical means, surgical intervention offers less risk then allowing the infant to continue the unrelenting vomiting that renders its condition progressively poorer.

BENJAMIN, Montreal, Canada.

PEPTIC ULCER OF MECKEL'S DIVERTICULUM: PERFORATION AND DIVERTICULOCOLIC FISTULA; SUBACUTE EVOLUTION OF CLINICAL MANIFESTATIONS. ROBERT DEBRÉ, H. BOPPE and G. SEMELAIGNE, Bull. Soc. de pédiat. de Paris **29**:402 (July) 1931.

A boy, 17 months old, had lost a good deal of weight, had a digestive disturbance and had shown melena at times for about a year. He was observed for a month in the hospital and showed no improvement. The tuberculin reaction and the Wassermann reaction of the blood were negative, and the marked emaciation was not satisfactorily explained. A small mass could be palpated just above and to the right of the umbilicus. Roentgenologic examination showed a narrowing of the transverse colon just to the right of the midline. Operation was performed, and the mass was found to include a Meckel's diverticulum which had ulcerated into the transverse colon, forming a diverticulocolic fistula; there was some localized plastic peritonitis. The child died the day following the operation. Sections of the diverticulum showed a mucous membrane resembling the gastric mucosa in parts and the intestinal mucosa in others; in places the glands of Lieberkuhn were lined by immature cells not unlike those seen in cancerous stomachs. It is noteworthy that ulcer of a Meckel's diverticulum does not invariably produce fulminating abdominal symptoms, as is illustrated by the long subacute clinical course in this case. There was practically no lymphoid tissue in the sections of the diverticulum; this is in marked contrast to the appendix, in which there is an acute inflammatory course because the organ is rich in lymphoid tissue. The simile that calls Meckel's diverticulum the "appendix of the ileum" is, therefore, not a happy one.

BENJAMIN, Montreal, Canada.

LIPOID NEPHROSIS IN AN INFANT ELEVEN MONTHS OLD. FATAL ENDING WITHOUT AN INCREASE IN BLOOD UREA. E. LEENHARDT, J. CHAPTAL, M. DUFOIX AND P. MONNIER, Bull. Soc. de pédiat. de Paris **29**:412 (July) 1931.

A girl, 11 months old, had been losing weight for two months. She showed marked pallor and generalized edema, more pronounced in the upper and lower extremities. She had marked digestive disturbance, vomiting almost all she ate.

There was no fever. She had marked oliguria. The blood showed normal urea, an increased chloride content, a lowered alkaline reserve and protein content, marked lowering of the albumin: globulin ratio, a lowered osmotic pressure of serum proteins and an increase in cholesterol. There was albuminuria. A high protein diet and the administration of thyroid were tried, but the child died about a week after admission to the hospital, so that there was hardly time to form any conclusion as to the effects of these therapeutic measures in this case. Necropsy was not performed.

BENJAMIN, Montreal, Canada.

SPONTANEOUS PYOPNEUMOTHORAX FOLLOWING PROLONGED INFLUENZAL BRONCHOPNEUMONIA IN AN INFANT FOUR MONTHS OLD. AXENTE IANCOU and L. P. DARIU, Bull. Soc. de pédiat. de Paris **29**:420 (July) 1931.

A male infant had an infection of the upper respiratory tract, and bronchopneumonia developed. A small pleural pocket of pus and spontaneous pneumothorax also developed. The child wasted rapidly, and died at the age of 4 months, after an illness of three months. Necropsy confirmed the clinical diagnosis. The organism found was the hemolytic staphylococcus. It is also noteworthy that this infant passed an ascaris at the age of 4 months.

BENJAMIN, Montreal, Canada.

INTESTINAL HEMORRHAGE, FIRST INDICATION OF MODERATE BUT PERSISTENT HYPERTENSION. M. DEGLOS, Bull. Soc. de pédiat. de Paris **29**:462 (Oct.) 1931.

A boy, 14 years old, was admitted to the hospital because of a profuse hemorrhage from the bowel. Examination revealed nothing abnormal, except high blood pressure and a rapid pulse rate throughout a period of observation. This was evidently a case of so-called essential hypertension.

BENJAMIN, Montreal, Canada.

SYMMETRICAL ABSENCE OF OSSIFICATION OF PARTS OF THE PARIETAL BONES IN A GIRL ELEVEN YEARS OLD. M. ARMAND-DELILLE, SCEMMAMA and DELIENCOURT, Bull. Soc. de pédiat. de Paris **29**:464 (Oct.) 1931.

A girl, 11 years old, was admitted to the hospital because of a sore throat. During physical examination circular areas of softness in the posterior superior parts of each parietal bone were noted. Roentgenologic examination showed that these circular areas symmetrically located in the parietal bones were devoid of bone. No exophthalmos was present. The case was presented at this meeting without any comment, as the authors intend to take up the subject of defective ossification of the cranial vault in a future communication.

BENJAMIN, Montreal, Canada.

SERUM-SICKNESS, VACCINE SHOCK AND BIOTROPISM. P. CHANTRIOT, Presse méd. **39**:1692 (Nov. 18) 1931.

Chantriot comments on the diversity of forms of serum-sickness and raises the question as to whether these are due to the serum itself or to latent forms of infection activated by the serum. A splendid parallel in chemotherapy is the activation of the treponema by antisyphilitic treatment. Reaction to foreign protein is so varied in its manifestations e. g., urticaria, erythema, arthralgia and polyneuritis as to suggest "biotropic accidents." Four cases, of the following conditions are cited: the production by antitetanic serum of bullous polymorphous erythema; the production by Dmelcos vaccine of facial zona; the production by typhoid-paratyphoid vaccine of herpes buccalis, and the production by gonococcus vaccine of pityriasis rosea. These, with cases reported by other authors, suggest to

the writer that most serum-sickness is more than mere "therapeutic accident," and may be due to an infectious organism to which the vaccine has rendered the victim more sensitive.

BIEKER, St. Petersburg, Fla.

ESSENTIAL HYPERTENSION IN CHILDHOOD. E. RELTENMEYER, Arch. f. Kinderh. **95**:41 (Nov.) 1931.

The author reviews the cases reported as of essential hypertension in childhood, describing a similar case that came under his own observation. He concludes that in no case has the diagnosis of essential hypertension been completely justifiable, and that the condition as such probably does not appear in childhood. He speculates as to constitutional factors, morbid conditions and infections that might be the forerunners of a primary hypertension, and emphasizes the necessity of the following of patients over a long period of time before any conclusions regarding this subject can be drawn.

LESLIE, Evanston, Ill.

A RARE CAUSE OF SUDDEN DEATH: PRIMARY SCLEROSIS OF THE PULMONARY ARTERY IN A TWELVE YEAR OLD GIRL. F. PUNTIGAM, Beitr. z. gerichtl. Med. **11**:106, 1931.

Sudden death of a 12 year old girl was the reason for a special investigation. Autopsy revealed marked arteriosclerosis of the pulmonary artery, with many small, yellow, circumscribed intimal thickenings, especially pronounced in both main branches. These branches were dilated and in some portions covered by mural thrombi, which were so large as to narrow their lumina markedly. The main pulmonary artery and the smallest branches showed no changes. In the course of the right pulmonary artery, several saclike dilatations were found. These dilated areas were filled with thrombi. Histologically, each of the larger branches of the pulmonary arteries showed a markedly thickened intima, which in places was twice as thick as the media. It consisted of a new formation of loose connective tissue. The internal elastic membrane was split in places, and the boundary between the media and the intima was not marked. The media also revealed a splitting of the intima and a new formation of connective tissue, with deposits of lime salts. Occasionally, small round cell infiltrations were noted in the media. The adventitia showed a perivascular infiltration by round cells. Regressive changes were not found. The heart was somewhat larger than normal. The right ventricle was larger than the left, dilated, its wall measuring 10 mm. in thickness, while the left ventricle measured 7 or 8 mm. The myocardium was normal. The ductus arteriosus was closed. The coronary vessels showed no changes. The peritoneal cavity contained 1,000 cc. of clear liquid. The liver, spleen and kidneys revealed marked chronic passive hyperemia.

The history which was obtained after the autopsy revealed that the patient had otitis media when she was 9 months old. At the age of 3, there was noted for the first time a disease of the circulatory apparatus, which increased in later years. Cyanosis was always marked thereafter. There was no edema or anasarca until a half year before death. Bloody sputum was often observed. The opinion is expressed that the otitis media had produced chronic inflammation of the pulmonary artery, which primarily was hypoplastic.

SAPHIR, Chicago. [ARCH. PATH.]

A STUDY OF TOTAL MINERAL METABOLISM IN CALCINOSIS UNIVERSALIS. J. FRIEDLÄNDER, Deutsches Arch. f. klin. Med. **166**:107, 1930.

An investigation of the mineral balance (nitrogen, sodium, potassium, calcium, mercury, chlorine and phosphorus) was made in an 11 year old girl with calcinosis universalis. There were eight three day tests during which the subject was given normal, low and high amounts of calcium; tests were made with racemic

ephedrine with a high calcium intake. There was only a slight retention of calcium (usually from 0.1 to 0.3 Gm.) with a normal amount of calcium in the diet (1,602 Gm. daily). Nine and six-tenths grams was retained when 8.2 Gm. was given daily for three days, and the total amount of calcium in the blood rose from 7.4 to 15 mg. per hundred cubic centimeters. With a diet high in calcium, accompanied by injections of racemic ephedrine (three injections of 0.03 Gm. daily) the retention sank to 2.2 Gm. in three days, and there was no increase in the blood calcium. Following the intravenous injection of 5 cc. of 10 per cent calcium chloride solution, the curve for serum calcium was normal. No pathologic changes were observed in the mineral balance for the other elements investigated or in the calcium : potassium or the calcium : sodium ratio. The nitrogen balance was faintly negative.

KUGELMASS, New York.

THE WATER CONTENT OF BLOOD DURING CARDIAC STASIS. C. ALBRECHT, Deutsches Arch. f. klin. Med. **171**:595, 1931.

The author's studies seem to indicate an abnormal accumulation of water in the blood during stasis, as evidenced by the considerable elimination of water during dehydration, and by the increase in the water content of the blood following aggravation of the circulatory disorder. During stasis, the protein content of the blood drops to a low normal, or a subnormal, level, despite the fact that the dry residue may be either normal or increased. The dry residue value of the blood depends largely on the erythrocytes, which seem to be independent of the water content. Even during stasis the erythrocyte count may be comparatively high. During dehydration, the number of erythrocytes may remain constant, increase or decrease. Thus, in certain cases of stasis the water content of the blood per space unit is normal in spite of the fact that the blood actually has absorbed water. It cannot be stated definitely whether this increase in the water content of the blood during stasis is accompanied by an increase in the total volume of the circulating blood.

DOOLEY, Kent, Conn.

MEASUREMENT OF TRANSVERSE SECTION OF ASCENDING AORTA: METHOD FOR DETERMINATION OF PULSE VOLUME. O. BICKENBACH, Deutsches Arch. f. klin. Med. **171**:647, 1931.

The author describes a kymographic-roentgenoscopic method for measuring the pulsatory fluctuations of the ascending aorta. This method is said to be satisfactory only for thin persons and for children.

DOOLEY, Kent, Conn.

GAS EXCHANGE AND GLYCOLYSIS IN PLEURAL EXUDATES. J. HERMS, Deutsches Arch. f. klin. Med. **172**:84, 1931.

The oxygen tension of clear exudates varies within the limits of that of venous blood, while the carbon dioxide tension may approach that of arterial blood. Purulent exudates, on the other hand, have a decreased oxygen tension, but the carbon dioxide tension may be abnormally high (up to 104 mm.) The total carbon dioxide content is less than that of normal blood, however. The hydrogen ion concentration, calculated from the relative values of free and combined carbon dioxide, is displaced toward the acid side in purulent exudates. Also there is a destruction of sugar, which is not balanced through acquisition of sugar from the blood, and a resulting accumulation of lactic acid as an intermediary product of this destruction of sugar. There seems to be a parallel between the diminution in total carbon dioxide, as well as the displacement of p_H toward the acid side, and glycolysis. It is to be assumed that the acidosis in purulent exudates is a consequence of glycolysis, the acid intermediary products of sugar destruction resulting in the driving out of carbon dioxide.

DOOLEY, Kent, Conn.

BLOOD PRESSURE REFLEX AND HYPERTENSION. H. KLINK, Deutsches Arch. f. klin. Med. **172**:135, 1931.

In the majority of adults with hypertension, and in persons of all ages with hypertension associated with renal insufficiency, a generalized reflex hypertension develops following compression of the upper arm during blood pressure tests. This hypertension reflex is absent in young persons who have hypertension without other evidence of disease.

DOOLEY, Kent, Conn.

BLOOD SUGAR CURVES IN THE SIBLINGS OF A DIABETIC CHILD. H. SEHESTEDT, Deutsches Arch. f. klin. Med. **172**:228 (Dec. 21) 1931.

The author studied six apparently normal brothers and sisters of a diabetic child, and found that all showed abnormalities in their blood sugar curves. The curves were determined after three different courses of carbohydrate ingestion: (1) 50 Gm. of dextrose at one time, (2) 20 Gm. of dextrose hourly for three hours and (3) 25, 50 and 75 Gm. of white bread at hourly intervals.

DOOLEY, Kent, Conn.

EXOGENOUS INSULINURIA IN DIABETIC PATIENTS. A. ATHANASIOU and H. REINWEIN, Deutsches Arch. f. klin. Med. **172**:307 (Dec. 21) 1931.

Six of twelve patients with severe diabetes showed blood sugar-reducing properties in the urine. This exogenous insulinuria bore no relation to the duration of the disease or to the length of time during which insulin had been administered. The largest quantities of insulin were found in the urine of two persons who used relatively large quantities of carbohydrate, although varying the carbohydrate intake did not vary the insulin output. The urine of a patient with renal glycosuria showed no blood sugar-reducing capacity after the injection of 60 units of insulin, whereas that of a normal person showed 6 units of insulin after the injection of only 40 units.

DOOLEY, Kent, Conn.

OSTEOGENESIS IMPERFECTA. W. HOF, Frankfurt. Ztschr. f. Path. **41**:306, 1931.

A case of osteogenesis imperfecta is reported in a 5 months old girl. At the time of birth, a fracture of the right forearm, marked bending of both shanks, genu extrorsum and talipes varus were noted. The child died of bronchopneumonia. The autopsy revealed plump extremities, a large head, multiple fractures, thickenings of the seventh and eighth ribs and internal hemorrhagic pachymeningitis. Both tibiae were markedly curved. The large fontanel was wide open and the skull very thin, with small hemorrhages below the periosteum. The dura was adherent to the skull. An enlargement of the thyroid gland was noted. Histologically, there was marked increase of cartilage throughout the bones, with some calcification. There was only slight formation of bone in the region of the calcified cartilage, in spite of the fact that the many coherent osteoblasts were found close to the epiphysis. The cortical layer was only slight in amount; its lamellated arrangement was missing. The bone marrow was markedly hyperplastic. Cysts filled with homogeneous material were found in the bone marrow. The older fracture revealed much callus, which in part contained cartilage. The author discusses the etiology of this disease, but does not believe that the hyperplasia of the bone marrow was the primary cause.

SAPHIR, Chicago. [ARCH. PATH.]

Nervous Diseases

CEREBRAL SPASTIC PARALYSIS IN CHILDREN. EDWIN W. RYERSON, J. A. M. A. **98**:43 (Jan. 2) 1932.

This common condition may be divided into two varieties: one occurring at or before birth and the other acquired in infancy or early childhood. The first

is due to intracranial hemorrhage and lack of development of the cerebral cortex. The second is the result of inflammatory changes following contagious or infectious diseases. The orthopedic surgeon usually sees the patient some time after its development, at which time there are three modes of attack: education, physical therapy and surgery. The author favors the more conservative in preference to the more radical treatment in these cases.

BONAR, Salt Lake City.

THE PSYCHOSEXUAL DEVELOPMENT OF THE CHILD. GERALD H. PEARSON, Ment. Hyg. **15**:685 (Oct.) 1931.

In the creation of behavior problems, the rôle of infantile maladjustment must be properly emphasized. Birth itself is a trauma, resulting in the sudden appearance of many unpleasant stimuli — noise, cold, dryness, carbon dioxide, etc. Only through the mother does the child find relief from these factors, and to its mother all its libido is attached. When the mother leaves the child, anxiety ensues. When the breast is withdrawn from the nursing infant, it fears that it will never be returned; in this manner, primitive anxiety states are brought into being, and at this time may be laid the basis of subsequent maladjustments. The child whose nursing has been curtailed will always feel cheated, always slighted; he will be the sort who considers himself consistently "picked on." Overnursing, too, results in problems; this child learns to expect everything and becomes irresponsible.

Pearson warns against attempting control of the bowel and bladder before the pyramidal tracts are developed, believing that demanding more of a child than he is physically capable of is psychically harmful. Training in excretion is an important process; by its overemphasis the parent will focus attention on the genitalia. Whatever control the infant does acquire is largely an effort at pleasing his mother; at first, in her absence, control is impossible, but later her memory image is enough to stimulate the child to control.

In lucid terms Pearson outlines the mechanism of the Oedipus complex, and in much less clear expressions, describes the development of the castration complex. He discusses sibling relationships, pointing out the special problems of the oldest child, the newest born, the middle child, and the only one. For example, he suggests that quarreling among brothers is due to the symbolization of the oldest boy as "father," and the privilege of venting the Oedipus-induced jealousy on him instead of on the real parent is irresistible.

Pearson analyzes the factors hindering psychosexual development. The triple mechanism of the ego, the id and the super-ego are in an easily disturbed balance; unusual stress, whether through trauma or training, on any one of these will upset the proportion. An overdeveloped super-ego may so suppress the manifestations of the id as to result in abnormal libidinous outlets. Tendencies to overreact to the stimulation of nongenital erogenous zones, such as the mouth or anus, may establish the foundation for an adult perversion. Id tension may be released in one of three ways: (1) direct expression, (2) indirect expression, (3) changed expression. As an example of indirect expression, Pearson cites the nonsexual curiosity of children — curiosity about science, for instance, as a surrogate for direct but forbidden sexual curiosity. As an example of changed expression, the author suggests that the energy that drives scientists to painstaking study is but the modification of a primitive impulse of cruelty—or a desire to tear things apart.

The paper is closed by the presentation of two clinical examples.

DAVIDSON, Newark, N. J. [ARCH. NEUROL. & PSYCHIAT.]

POSSIBLE ORIGIN AND TREATMENT OF NAIL-BITING. G. ZABOROVSKI and ROBERT JEUDON, Bull. Soc. de pédiat. de Paris **29**:430 (July) 1931.

Nail-biting is a form of "pica" which the authors believe to be due to deficiency in vitamins, particularly in vitamins B and D. They have seen onychophagy dis-

appear in patients after eight or ten days of vitamin therapy. In one child they succeeded in making the condition recur by withholding the vitamins from the diet; the condition disappeared when they administered a sufficient quantity of the vitamins in the diet.

BENJAMIN, Montreal, Canada.

HEMATEMESIS ASSOCIATED WITH CEREBRAL TUMORS. J. HALLE and J. LEREBOULLET, Bull. Soc. de pédiat. de Paris **29**:465 (Oct.) 1931.

A boy, 6 years old, was admitted to the hospital because of hematemesis. He was treated for gastric ulcer, first medically and then surgically. At operation it appeared that there was an ulcer of the lesser curvature, and a gastro-enterostomy was done. He improved temporarily, but soon began to vomit blood again. He was again admitted to the hospital, and this time, several months after the onset of the hematemesis, he showed obvious signs of a cerebral tumor. He died the day before he was to be operated on. At necropsy a tumor of the fourth ventricle was found, a medulloblastoma. The stomach was normal, and gastro-enterostomy showed nothing abnormal. An onset marked by digestive disturbance in cases of tumor of the fourth ventricle has been recorded repeatedly, although the occurrence of hematemesis as the sole symptom for a number of months in a child with tumor of the fourth ventricle is rare.

BENJAMIN, Montreal, Canada.

PROGRESSIVE PALLIDAL RIGIDITY AND CONGENITAL REGRESSIVE RIGIDITY (PRESENTATION OF TWO CLINICAL CASES). PAUL VAN GEHUCHTEN, J. de neurol. et psychiat. **31**:560 (Sept.) 1931.

The author presents two cases. The first is described as a syndrome of progressive pallidal rigidity. The patient, a boy, aged 6 years, was born at term after a long, difficult labor. Development was more or less normal until the age of 2 years. He was able to stand at 1 year and gradually learned to walk, although with difficulty. At the age of 2 years there was a slow regression of voluntary movement; at the same time rigidity and choreo-athetosis developed. Objectively there were also dysarthria and spasmodic laughing. The author discusses the literature on the case; only a few similar cases have been reported. The second case is described as the syndrome of Cécile Vogt. In this instance the child was premature. At the age of 1 year extrapyramidal rigidity developed, complicated by choreo-athetosis, dysarthria and some dysphagia, but without pyramidal tract signs and without important intellectual deficit. The syndrome progressed to the point at which voluntary movement was practically impossible.

The author believes that these two conditions are comparable, the important difference being that the second case was congenital, whereas the first was not, the pallidal degeneration and rigidity appearing later. The etiology of the second type of case shows it to be due probably to dysgenesis, whereas the first type is usually associated with difficult labor and asphyxia and is possibly due to some cerebral, circulatory disturbance. The pallidal rigidity type of case is associated with a disturbance of the pallidum, spoken of as status dysmyelinisatus, while the other condition is associated with lesion of the striatum, known as status marmoratus. The author believes that by the study of cases such as these one may eventually arrive at the function of the paleostriatum and of the neostriatum. To the pallidal system is attributed the more important rôle in the regulation of postural tone. By some, the symptoms of choreo-athetosis and dyskinesia are interpreted as being evidence of striatal lesions, while others believe that such symptoms are evidence of involvement of the pallidum.

WAGGONER, Ann Arbor, Mich. [ARCH NEUROL. & PSYCHIAT.]

PRIMARY JUVENILE PARALYSIS AGITANS. LUDO VAN BOGAERT, Rev. neurol. **2**:315 (Sept.) 1930.

Van Bogaert presents a clinicopathologic study of a case of primary paralysis agitans beginning at the age of 7 years. This progressed slowly, and was char-

acterized more particularly by tremor, without hypertonus but with rather marked dysarthria and retropulsion. There were no definite indications of hepatic disorder; the patient died at the age of 30 of an intercurrent disease. The most striking feature in the brain was degenerative atrophy of the globus pallidus, with partial involvement of the corpus subthalamicum and locus niger. The neostriatum seemed relatively uninvolved. There was atrophy of the connections between the striate body and the corpus subthalamicum and substantia nigra, and more markedly of those between the lenticular nucleus and globus pallidus. There were no cortical, thalamic or cerebellar lesions.

FREEMAN, Washington, D. C. [ARCH. NEUROL. & PSYCHIAT.]

BENEDICT'S SYNDROME WITH AUTOPSY. SOUQUES, CROUZON and BERTRAND, Rev. neurol. **2**:377 (Oct.) 1930.

In a patient, aged 50, there had been a syndrome of Benedict from the age of about 4 years. There were paralysis of the right oculomotor nerve and spontaneous involuntary movements on the left, with paresis and contracture. The movements were very brusk, forceful and active, so that the patient had to keep her hand constantly controlled either behind her back or by the opposite hand. Movements were present also in the foot, and especially in the thigh. Voluntary movements were much limited. The face was less affected. It was impossible to examine the reflexes satisfactorily on account of the constant brusk movements, and it was also impossible to determine whether or not a Babinski sign was present. The patient complained of cramps in the limbs, but no objective disturbance of sensibility was noted. The development of the limbs had been arrested in large part. The right oculomotor nerve was not completely paralyzed, but there was no reaction to light, and the accommodation response could not be tested. The left eye was normal.

After death, a focus was found involving strictly the red nucleus on the right side and interrupting most of the fasciculi of the third nerve. The pyramidal tract was entirely uninvolved. The upper pole of the red nucleus was normal, and the corpus subthalamicum presented no lesions. The lateral part of the red nucleus had suffered less than the others. Wernicke's commissure was asymmetric, and the central tegmental fasciculus was scarcely visible. The reticular substance was markedly reduced. The left superior cerebellar peduncle was only about one-third as large as the right. The median fillet, however, was equivalent on the two sides. In the medulla there was hemiatrophy on the left side of the restiform body and of the reticular substance, and the periolivary stratum was reduced and pale. Nothing abnormal was observed in the spinal cord, and it was impossible to follow the course of the rubrospinal fasciculus.

The authors have collected and abstracted a number of cases of similar character, and compared the syndrome of Benedict with that of Claude and others of the same nature.

FREEMAN, Washington, D. C. [ARCH. NEUROL. & PSYCHIAT.]

MACROGENITOSOMIA PRAECOX WITH HYDROCEPHALUS DUE TO INFLAMMATORY LESIONS IN THE INFUNDIBULUM. A. THOMAS and H. SCHAEFFER, Rev. neurol. **2**:595 (Nov.) 1931.

A boy, aged 12 years, had had a large head at birth and had suffered from an acute infection, possibly meningitis, at 3 or 4 months, accompanied by several convulsive seizures. He was able to walk at 3 or 4 years. The present condition began with periodic, violent headaches and some vomiting. The head was large; there were bilateral spasticity and bilateral optic atrophy. He seemed well developed physically, but showed precocious development of the sexual organs, this development having occurred at the time of the onset of the headache. There was no polyuria, narcolepsy or glycosuria, and the spinal fluid was normal. The methylene blue test showed no penetration from the ventricles to the spinal canal. Meningitis, limited to the spinal canal, developed, and the child died. At autopsy

the infundibular region was the seat of marked thickening and fibrosis, and there was general overgrowth of the glial tissue, accompanied by inflammatory lesions beneath the ependyma lining the third ventricle. In addition, there was a low grade meningitis completely blocking the spinal canal in the cervical region, with suppurative meningitis below this. The hypophysis was flattened, but appeared normal; the thyroid and suprarenals likewise were normal. The testes weighed 30 Gm. and appeared completely developed. There was nothing abnormal in the region of the epiphysis.

FREEMAN, Washington, D. C. [ARCH. NEUROL. & PSYCHIAT.]

LIMITS AND SIGNS OF BIOLOGIC RESISTANCE IN TYPES OF HIGHER NERVE ACTIVITY OF ANIMALS (TEMPERAMENT AND BIOLOGIC RESISTANCE). J. F. FROLOW and S. A. CHARITONOW, Arch. f. d. ges. Physiol. **228**:17, 1931.

By studying conditioned reflexes and inhibitions Pavlov has identified three different kinds of temperament in dogs. In the extremes the excitatory or the inhibitory process predominates; in the middle group these processes are well balanced. The authors found that the characteristic temperament could be discovered in dogs as early as the second month of life.

Twenty-five dogs about 3 months of age were used. The effects of hunger were studied by following the weight and the changes in previously elaborated conditioned reflexes. Temperament was determined by the speed of formation of positive and negative conditioned reflexes. The starvation lasted from twenty-one to thirty days. The dogs with the excitatory type of temperament lost more weight and at a more rapid rate than did those of inhibitory type. On recovery the inhibitory type gained more and at a more rapid rate. The change in conditioned reflexes showed in general intensification of the originally predominating process. Thus the excitatory type became more pronounced and less able to learn inhibitions (See Krasnogorshi, N. I.: Neuroses in Children, AM. J. DIS. CHILD. **30**:753 [Dec.] 1925.)

KISER, Atlanta, Ga.

CHOREA MINOR: I. ETIOLOGY AND DIFFERENTIAL DIANOSIS. G. LENART and E. VON LEDERER, Arch. f. Kinderh. **94**:256 (Oct. 23) 1931.

Through a study of the change in the eosinophil count following the injection of parathyroid extract-Collip in seventeen cases of chorea minor, the authors feel they have definite evidence that this type of chorea is associated with a lowering of the parathyroid hormone in the blood. Normally, the eosinophil count does not increase after the injections, but in cases in which the eosinophil count is low, there occurs, after four to five hours, a temporary marked increase in the eosinophils. This occurred in cases of true chorea minor, but not in cases of hemichorea, hysteria or syphilis of the central nervous system, and should therefore be an aid in differential diagnosis.

LESLIE, Evanston, Ill.

ON CHOREA MOLLIS. E. SCHIFF, Jahrb. f. Kinderh. **134**:143 (Jan.) 1932.

A girl of 8 years, in the eighth week of typical Sydenham's chorea, suddenly lost the choreic movements and appeared to be completely paralyzed and comatose. After two weeks the choreic movements reappeared, and in three and one-half months the child was well. She stated that she had been conscious of everything said in her environment while paralyzed. Schiff briefly reviews the literature of paralytic chorea.

CLAUSEN, Rochester, N. Y.

THE DEMONSTRATION OF VACCINE VIRUS OR ENCEPHALITIS VIRUS BY CORNEAL INOCULATION. H. GASTEIGER and V. NIEDERWIESER, Jahrb. f. Kinderh. **134**:184 (Jan.) 1932.

Knauer and Jaensch (*Jahrb. f. Kinderh.* **130**:265, 1931) claimed to have demonstrated the presence of the virus of encephalitis in a great variety of disorders,

by inoculation into the eye of the rabbit, using fluorescein to show corneal defects. Gasteiger and Niederwieser, attempting to repeat the work, found that the corneas of all rabbits without exception are colored by fluorescein, whether or not the animals have been inoculated.

CLAUSEN, Rochester, N. Y.

THE TREATMENT OF CHOREA MINOR WITH PHENYL-ETHYL-HYDANTOIN AND PHENOBARBITAL. HERMANN FLESCH, Kinderärztl. Praxis **2**:533 (Dec.) 1931.

Flesch reports good results in the treatment of chorea with phenyl-ethyl-hydantoin in daily doses of from 0.2 to 0.45 Gm. for from seven to fourteen days. The patient usually reacts with exanthem, fever and eosinophilia (from 10 to 20 per cent of eosinophils). The eosinophilia is the most constant of the three phenomena. The author is convinced that the fever has nothing to do with the beneficial results. Phenyl-ethyl-hydantoin was used in nine cases of chorea, four of them severe, four moderately severe and one mild. In seven cases a complete reaction was observed (i. e., fever, exanthem and eosinophilia), and in all the cases eosinophilia occurred. Seven patients were cured in from thirteen to thirty-seven days. Two recovered only after the use of arsphenamine and phenobarbital.

In 1930, because phenyl-ethyl-hydantoin could not be obtained, phenobarbital was tried. This was given three or four times a day up to a total daily dose of from 0.135 to 0.180 Gm. (from 2 to 3 grains). Like phenyl-ethyl-hydantoin, phenobarbital caused fever, exanthem and eosinophilia, though the reactions were milder and less constant. Twenty-eight patients were treated with phenobarbital, and all but one recovered. The average length of time required for complete recovery was from two to three weeks and the longest five weeks, and in many cases distinct improvement began in the first few days. There were no ill effects of any kind, since children seem to tolerate phenobarbital well.

In a few cases, after treatment with the phenyl-ethyl-hydantoin and with phenobarbital, chorea recurred, but too short a time has elapsed to permit the presentation of definite percentages.

HUENEKENS, Minneapolis.

THE SIGNIFICANCE OF THE PEROXIDASE REACTION. FEDIE SARTORIUS, Monatschr. f. Kinderh. **50**:309, 1931.

In a recent communication, Japanese observers described a reaction of the polymorphonuclear leukocytes to certain reagents, the peroxidase reaction. By means of this test, they claimed to differentiate lesions of the pyramidal tract from lesions of the corpus striatum and from acute encephalitis. The author repeated the test in a series of cases, but could not affirm these observations.

GERSTLEY, Chicago.

THE SPASTIC REFLEXES IN INFANCY. GERD VOSS, Monatschr. f. Kinderh. **50**:331, 1931.

The Rossolimo reflex is elicited by forcible extension of the toes by means of a sudden blow from below. The reflex consists of plantar flexion of the great toe, usually in combination with the other toes. The Mendel-Bechterew sign consists of a plantar flexion of the toes following a blow on the back of the fourth metatarsal. Normally an extension of the toes follows. In a study of 218 normal infants the author observed that the Rossolimo and the Mendel-Bechterew reflexes are to be considered as normal and physiologic until the age of 4 weeks. The Babinski sign should be considered physiologic until 2 years of age.

GERSTLEY, Chicago.

EXPERT OPINION ON PSYCHOPATHIC PATIENTS. BERTHOLD MAIER, Ztschr. f. Kinderforsch. **38**:672 (Aug. 15) 1931.

The author describes his system of examining psychopathic patients and describes his experience in the Detention Home at Bräunsdorf. He attempts not

so much to diagnose the condition presented as to describe the development of the personality, since he believes that only by such a method can one differentiate between the incurable inherited defects in character and those determined by environment. In early stages the latter are subject to the good effects of change in environment and of reeducation. Even an inherited defect must not be regarded as an inexorable fate, but must be weighed in relation to the burden put on the child.

REICHLE, Cleveland.

ORGANIC SIGNS IN CHILDREN SUFFERING FROM MENTAL DEFICIENCY. ENGE, Ztschr. f. Kinderforsch. **38**:688 (Aug. 15) 1931.

This paper is a lecture given in a postgraduate course for practicing physicians, and represents an attempt to describe some of the deformities, defects and other signs and symptoms found in children who are suffering from mental deficiency. It also describes the mental attitudes of the psychopathic child.

REICHLE, Cleveland.

EPILEPSY IN CHILDREN. M. G. PETERMANN, Ztschr. f. Kinderh. **51**:506, 1931.

Epilepsy is a constitutional disease, with convulsions as the chief symptom. This disturbance rests on an irregularity in the water economy, especially of the brain cells. The best therapeutic measures are hunger, the ketogenic diet, phenobarbital and dehydration, and the common denominator of all these may be dehydration. If the disease is advanced, repeated convulsions having produced definite changes in the brain, the means used to produce dehydration are naturally of little value.

EMERSON, Boston.

CONGENITAL FUNCTIONAL DEFECTS OF THE CENTRAL NERVES. H. SPATZ and O. ULLRICH, Ztschr. f. Kinderh. **51**:579, 1931.

The case of a child, aged 3 months, is reported who was born with bilateral paralysis of the external muscles of the eye and almost complete bilateral facial paralysis. Autopsy revealed aplasia of the abducens, hypoplasia of the facial and diplasia of the trochlear nerve. These could not have been due to a birth injury, and it is difficult to say whether there was atrophy or absence of formation.

EMERSON, Boston.

A PECULIAR CASE OF CHOREA. V. VYŠIN, Časop. lék. česk. **68**:1614 (Nov. 22) 1929.

In a girl, aged 13 years, there developed a fever, tachycardia, irregularity, a systolic murmur, but no cardiac enlargement, later athetoid movements, possibly a pericardial rub and marked psychic instability. The cardiac symptoms gradually subsided, and the ultimate diagnosis was chorea, chorea cordis and hysteria (cardiac neurosis). The literature on chorea cordis, psychic reactions and choreic delirium is reviewed. This girl was somewhat emotional generally, and the oliguria and anuria found during her attack are conditions often reported with hysteria. The pathologico-anatomic observations of various authors are cited and are the usual cortical, meningeal, caudate nucleus, thalamus, subthalamus and ganglion changes. Puberty, the menses and pregnancy are periods of predisposition for chorea.

STULIK, Chicago.

THE HEREDITY OF MYOTONIA CONGENITA (THOMSEN). EMILIE VEJNAROVA, Časop. lék. česk. **69**:645 (April 25) 1930.

Thomsen's disease may be inherited as a dominant or as a recessive factor, i. e., the former as a heterozygotic and the latter as a homozygotic attribute. Heredity seems to involve an idiosyncrasy for the characteristics of the disease.

The change in the valence of the disease in some cases, e. g., in dystrophia myotonica, depends on the association of additional symptoms not found in other cases. Both sexes are equally afflicted.

STULIK, Chicago.

MAY THE CAUSE OF LITTLE'S DISEASE BE GAS-EMBOLI OCCURRING DURING PARTURITION? L. LANGENSKIOLD, Finska läk.-sällsk. handl. **73**:755 (Oct.) 1931.

The author finds a resemblance between caisson disease and spastic diplegia. He describes a series of experiments on rabbits, and concludes that often the cause of spastic diplegia in infants is gas emboli occurring at birth.

ELGHAMMER, Chicago.

Surgery and Orthopedics

UNUSUAL RENAL ANOMALIES: CASES OF RENAL AGENESIS, UNILATERAL CONGENITAL RENAL HYPOPLASIA AND CROSSED RENAL DYSTOPIA. E. R. MINTZ and J. D. STEWART, New England J. Med. **205**:1282 (Dec. 31) 1931.

In 6,000 postmortem examinations at the Massachusetts General Hospital 6 instances of renal agenesis have been encountered. Most authors agree that the left kidney is more frequently lacking than the right. The symptoms occurring in these comparatively rare anomalies usually are pain, hematuria and a palpable abdominal tumor. Inadequate drainage and faulty vascularization are probably the agents that lead to the production of symptoms by predisposing the kidney to pyogenic infection, tuberculosis, formation of stones, cystic deterioration and nephritis.

CASE 1.—A Finnish school girl, aged 15 years, was admitted to the hospital with pain in the right flank and loin of two weeks' duration. The past history was unimportant until five weeks before admission, when the patient was seized with a sharp lancinating pain in the right lower quadrant of the abdomen. The diagnosis was acute appendicitis or right renal colic. After one week in bed in another hospital some pain persisted and appendectomy was performed, with an uneventful convalescence. The appendix was normal.

Two weeks before admission the patient noticed dull nonradiating pain in the right loin, without urinary symptoms. Examination at the hospital revealed a slightly tender mass in the right flank, which descended with respiration. The left kidney was not palpable. The blood and urine were normal; the renal function test showed 20 per cent excretion in the first hour. The blood nonprotein nitrogen was 29 mg. per hundred cubic centimeters. At cystoscopy the bladder and the right ureter and kidney were apparently normal, while in the left ureter the catheter met an obstruction 20 cm. from the bladder and no urine was obtained. Pyelography by injection through the bladder, and later by the intravenous injection of iopax, confirmed these findings. At operation the left kidney and the upper three fourths of the left ureter were removed. The final diagnosis was congenital fetal kidney (left), stricture of the left ureter and left hydro-ureter. The pathologist could recognize no kidney tissue.

CASE 2.—A Russian laborer, aged 38 years, had clinical symptoms of gastric cancer and died. The observations at necropsy were adenocarcinoma of the stomach with metastases to the wall of the right ureter and general peritonitis. The left kidney, the entire left ureter and the left renal artery and vein were absent, and there was no ureteral orifice in the left half of the bladder. The right kidney was in the normal position and weighed 250 Gm.

CASE 3.—A boy aged 17 was admitted to the hospital for persistent vomiting. There was a history of an operation at another hospital when the patient was 8 months old, presumably for intussusception. Three days before admission the patient noticed loss of appetite, but felt no particular discomfort. Two days before admission he was seized with a shaking chill and was put to bed. At five

o'clock in the afternoon vomiting occurred, and vomiting and retching were frequent thereafter. During the day before admission nothing taken by mouth could be retained. No urinary symptoms had been noticed. On admission the rectal temperature was 102.6 F., the pulse rate was 130 and the leukocyte count was 20,000. The urine contained a slight trace of albumin, an occasional hyaline cast and an occasional leukocyte per field. Examination of the abdomen revealed a somewhat irregular mass about the size of a man's doubled fist in the right flank.

An exploratory operation for possible acute appendicitis was performed, and a normal appendix was removed. The cecum and the ascending colon were distended, and in the mesentery of the terminal ileum were dull red lymph nodes as large as 2 cm. in diameter. The mass in the right flank resolved itself on examination into an anomalous mass of renal tissue, the right kidney being in lateral apposition with, and firmly adherent to, a second and similar body overlying it. About two weeks later pyelographic studies were made with intravenous injections of iopax and also by cystoscopy and ureteral injection. The bladder and ureteral orifices were normal; the left ureter crossed the midline at the sacral promontory to join its pelvis, which lay somewhat below and medial to the pelvis of the right kidney. The outline of the pelvis was not abnormal, but on both sides it was directed laterally instead of toward the midline.

The final diagnosis was unilateral fused kidney or crossed dystopia with fusion.

GENGENBACH, Denver.

TUBERCULOUS HIP. R. B. WADE, M. J. Australia **2**:799 (Dec. 26) 1931.

The discussion is concerned with the conservative versus the operative treatment.

The author emphasizes the fact that the stage of activity is always long — at least two years — and that rest in bed must be maintained throughout. There is a second stage of about the same length during which there is little change in the condition of the hip. The third stage occurs when active healing is taking place.

Deformities are an invariable part of the disease, and most methods of splinting are inadequate. Ankylosis of the joint must be firm to give good functional results, and the most serviceable angle of the limb must be maintained. The aim of operative treatment is to secure firm ankylosis in a serviceable position and do it in a shorter length of time. Methods of follow-up examination, etc., do not yet permit of a definite decision in favor of either method.

The author also stresses the importance of the mental state of the child in aiding his recovery.

TENNEY, Madison, Wis.

TUBERCULOUS DISEASE OF THE HIP JOINT. D. J. GLISSAN, M. J. Australia **2**:803 (Dec. 26) 1931.

The author points out five facts that are important to keep in mind in dealing with tuberculosis of the hip. 1. It is a local manifestation of a generalized disease. Hence control of all factors of environment during the long convalescence is important. 2. It is a long, drawn-out disease which requires continuous treatment, hence the importance of correct diagnosis. 3. It is an inflammatory disease, and the basis of treatment must be rest. 4. It is a deforming disease, and the deformities must be controlled so as to leave the best possible function. 5. It is a destructive disease, and the abscesses must be treated so as to minimize the chances of secondary infection.

TENNEY, Madison, Wis.

ORTHOPEDIC TREATMENT OF SUBOCCIPITAL POTT'S DISEASE (INTERATLO-AXOID VARIETY). M. GALLAND, Bull. et mém. Soc. d. chirurgiens de Paris **23**:622 (Nov. 20) 1931.

Massart reports a study of Galland on the treatment of suboccipital Pott's disease, in which he shows that the essential characteristic of this disease is a tendency to an inclination with slipping downward and forward of the atlas on

the axis. Two pathognomonic signs of this lesion are demonstrated by roentgen examination: (1) widening of the clear space that separates the posterior surface of the anterior tubercle of the atlas from the anterior surface of the odontoid process, and (2) absence of the parallelism of the axes of the atlas and the axis.

The inclination and slipping may be corrected by suitable treatment. A celluloid minerva cast, with a movable chin piece and an adjustable frontal bandeau, has proved satisfactory as used by the author. BIEKER, St. Petersburg, Fla.

PLEUROPULMONARY SUPPURATION; BRONCHOSCOPY; THORACOTOMY; CURE. H. GRENET, P. ISAAC-GEORGES and MÉZARD, Bull. Soc. de pédiat. de Paris **29**:393 (July) 1932.

A boy, 3 years of age, had bronchopneumonia, followed by three abscesses of the lungs and empyema. He was dangerously ill, and it is believed that the general condition improved considerably as a result of bronchoscopic treatment. A thoracotomy was performed three and a half months after the onset of the disease, and the child was cured. BENJAMIN, Montreal, Canada.

A CASE OF FIBROMA OF THE ABDOMINAL WALL IN A GIRL TWO YEARS OLD. H. GRENET and MEZARD, Bull. Soc. de pédiat. de Paris **29**:396 (July) 1931.

A girl, 2 years old, otherwise perfectly well, had a tumor of about the size of a hen's egg attached to the abdominal wall in the midline about midway between the umbilicus and the symphysis pubis. Measles developed during the child's stay in the hospital, and it was noted that the tumor grew larger during her convalescence from this disease. The tumor was excised without difficulty; histologic study proved it to be a fibroma. This is an instance of rare occurrence in children, although it is commoner in adults. Over 90 per cent of the cases reported have occurred in females. The origin of these fibromas admits of several theories; the authors believe that they have a congenital origin.

BENJAMIN, Montreal, Canada.

EPIPHYSITIS DURING GROWTH OF ILIAC CREST. C. ROEDERER, Bull. Soc. de pédiat. de Paris **29**:431 (July) 1931.

The center of ossification for the iliac crest does not appear until the age of from 14 to 16 years, and does not fuse with the ilium until from 20 to 25 years. This allows it to be subject to repeated traumas, even though these may be minor, e. g., the rubbing of a school-bag, the sudden pull on the muscles attached to the crest of the ilium, as in running, jumping, etc. The author believes, that these minor injuries, especially when often repeated, are the cause of the epiphysitis, although some consider that an infectious etiology plays a part. The chief symptom is pain, locally, and occasionally radiating to the back; this pain is frequently intermittent and present only when pressure is applied over the crest of the ilium or traction is put on it. The roentgenologic examination usually gives negative results. No treatment is mentioned. The condition subsides when the cause of the irritation is removed, and eventually the crest becomes consolidated with the ilium. BENJAMIN, Montreal, Canada.

INDICATIONS FOR SURGICAL INTERVENTION IN POTT'S DISEASE IN CHILDREN. ANDRÉ RICHARD and JEAN CALVET, Presse méd. **39**:1849 (Dec. 16) 1931.

Richard and Calvet review the operative procedures used in the treatment of Pott's disease in children. The article deals mainly with osteosynthesis, because of the precise indications for this procedure. The cases in which osteosynthesis is the method of choice fall into three main groups: those in which the course of the disease is unduly prolonged; those with gross secondary deformities, and those occurring in older children in whom the disease has the same course as in the adult. Contraindications are a poor general condition or a serious local condition.

Other procedures less commonly used but having definite indications are: abrasion of the spinous processes, for the correction of acute gibbosity; costotransversectomy, for the relief of spasmodic paraplegia, and finally the removal, *en bloc,* of abscesses. These methods are exceptional.

BIEKER, St. Petersburg, Fla.

MULTIPLE SARCOMATOSIS IN A CHILD TWENTY MONTHS OLD. M. ACUÑA and A. PUGLISI, Arch. argent. de pediat. **2**:432 (Aug.) 1931.

The authors report the case of a 20 months old child who, at the age of 9 months, presented a tumor mass in the posterior part of the neck which subsequently extended to the scalp, face and testicles in the form of multiple metastatic tumors.

Biopsy showed the growth to be a lymphoblastic sarcoma originating in the soft tissue of the cranium. There were no abnormal changes in the blood except for relative lymphocytosis (total white count, 8,500; lymphocytes, 80 per cent). Death occurred suddenly at the age of 20 months.

The authors point out as a matter of great interest and rarity the complete absence of involvement of the viscera and lymph glands and the slight change in the blood.

SCHLUTZ, Chicago.

MALIGNANT RHABDOMYOMA OF THE PROSTATE GLAND IN A CHILD. K. KATZMANN, Frankfurt. Ztschr. f. Path. **41**:297, 1931.

Such a tumor is reported in a 13 months old child. Grossly, it was of the size of a hazelnut and of very firm consistency, and protruded into the urinary bladder. It had led to a compression of the mouth of the urethra. There also was found a cystopyelitis. Histologically, the tumor consisted of transversely striated muscle fibers, with many cells. The cells had many nuclei, were rich in chromatin and showed several nucleoli. In addition to the transverse striations, a longitudinal striation of the fibers was occasionally observed. An invasion of the blood vessels by the muscle elements was often found. Thirteen cases of rhabdomyoma of the prostate gland reported in the literature are also briefly discussed.

SAPHIR, Chicago. [ARCH. PATH.]

Miscellaneous

THE RELATIONSHIP OF GROWTH AND DEVELOPMENT TO ABNORMALITIES OF DENTITION. ISAAC A. ABT, Arch. Pediat. **48**:705 (Nov.) 1931.

Malocclusion and dental irregularities do not depend on a single cause, but on a number of variables and factors which are only local expressions of some constitutional abnormality. The author discusses the following factors and conditions in their relation to the health of teeth: heredity, acromegaly, rickets, tetany, scurvy, syphilis and nutrition. The relation of the endocrine system and the various known vitamins to the development of the teeth and the lines of the face is discussed in some detail.

WADDELL, University, Va.

THE DEVELOPMENT OF PEDIATRICS IN NEW YORK CITY. LINNAEUS EDFORD LAFETRA, Arch. Pediat. **49**:36 (Jan.) 1932.

The author gives a review of pediatrics in New York from its beginning as a specialty to the present time. This article does not lend itself to abstracting and must be read in its entirety.

WADDELL, University, Va.

THE BABY'S CLOTHING. J. J. MOCH, Dallas M. J. **18**:56 (April) 1932.

The author groups the babies according to age and then discusses in a manner interesting to the mothers the type of clothing to be worn by each group. He

states that children under 1 year in a southern climate are usually overdressed, and emphasizes the following points of advice to mothers: (1) Maintain a constant temperature for the child by varying the quantity of the outer garments rather than the weight of the under garments; (2) avoid the use of pins where possible; (3) use garments that give the infant freedom of motion; (4) use garments that require the least possible annoyance to the baby, and (5) protect all parts of the body against undue exposure. SMITH, Sherman, Texas.

PARENT-TEACHER ASSOCIATIONS AND THE FAMILY OF TOMORROW. NEWELL W. EDSON, J. Social Hyg. **17**:287 (May) 1931.

Modern youth have few of the inhibitions of previous generations regarding the family, and are challenging values, especially the institution of monogamy. Society must provide training to check family failures. Minimum essentials of such training include information under the following heads: (1) the values and limitations of the family; (2) enough of the history of the family to show major trends and contributions and what has been sound and unsound in these trends; (3) analysis of various family rôles and relationships; (4) interpretations of mate relationships; (5) understanding of the challenges that modern life is making to the family, and (6) analysis of present sex conduct, including its wholesomeness and extravagances. To help in this educational task the parent-teacher association may: (*a*) stimulate study and reading about the family; (*b*) develop family topics and sessions; (*c*) encourage the school to include appropriate materials in courses; (*d*) insert appropriate quotations in parent-teacher bulletins; (*e*) encourage church and religious lecture-discussion in preparation for marriage; (*f*) encourage community moves for wholesome environment free from the menaces of unregulated amusement, and (*g*) help regulate the "movies" that interpret the family, to secure a sound interpretation of this most human institution, insisting that special performances for children be made wholesome. GRAVES, New York.

THE HEALTH OFFICER'S VIEWPOINT OF CHILD HYGIENE. T. CLARK, Pub. Health Rep. **47**:487 (Feb. 26) 1932.

The author presents an excellent résumé of problems and results in child hygiene. SANFORD, Chicago.

THE EDWARD CLARK CHAIR OF CHILD LIFE AND HEALTH. CHARLES M'NEIL, Edinburgh M. J. **39**:1 (Jan.) 1932.

A new chair has been founded in Edinburgh University under the name of Child Life and Health. M'Neil thinks the name has been well chosen because of its breadth, as it includes the diseases of childhood and the children themselves. Although the word "pediatrics" may express the meaning just as well, it is thought to be a little harsh to the ear and not generally so clear in its meaning.

Professor M'Neil paid tribute to his predecessors in the Children's Hospital, who have helped to educate many generations of medical students. He especially mentions Dr. John Thomson. There has been great improvement in the medical knowledge of children in the last half century, but he thinks that teaching has lagged behind scientific study. Improvement in teaching is the need of the hour. In the curriculum of Edinburgh University the separate teaching of diseases of children consists of a three months' course. The writer questions whether this meets the present requirements of medical practice among children and whether the program is planned along the right lines.

The foundation of this chair is made the occasion to review and improve the program of teaching. The curriculum as it concerns children has been mostly a course of clinical teaching of diseases. It is below the models and standards that exist in Edinburgh for teaching medicine and surgery. There should be systematic lectures which deal with the fundamental processes of growth as a basis for instruction in the study of disease, for on them rests the preservation of

health. Education for the nurse is also needed and contemplated. The writer hopes that some of the best of the young medical graduate will be attracted by the opportunities in this broader field of child life and health.

NEFF, Kansas City, Mo.

INSTITUTIONAL AGAINST FAMILIAL EDUCATION. H. PARADEISER, Rev. internat. de l'enf. **12**:182 (Sept.-Oct.) 1931.

Whether education should be a familial or an institutional responsibility is a serious problem, one of many now engaging the best thought of Germany. It is recognized that the primitive form of education was confined to the family circle until a comparatively recent period when the present system of collective study was inaugurated. The war and the economic crisis that followed brought great changes in family life and in educational facilities; employment of mothers, bad housing, tuberculosis, abuse of alcohol and the nervous strain of disordered living have served as factors contributing to the disintegration of the family and to the rather exaggerated opinion of the value of institutional education.

Paradeiser contrasts the advantages of home training with those of the modern elementary school and finds much to recommend the former in its better appraisal of the individual character and needs of the children, in the mutual trust and confidence existing between mother and offspring and in the absence of the strict discipline of institutional life which so often leads to psychologic conflicts.

AMESSE, Denver.

SELECTION OF SYMPTOMS IN THE CHILD. ALFRED ADLER, Kinderärztl. Praxis **2**:398 (Sept.) 1931.

To understand the psychology of the neurotic child, the wise physician must realize that the patient selects his symptoms to suit his own individual case. The same symptoms may require different interpretations in different cases, depending on the child's "psychic constitution," which is usually fully developed by the fifth year. This "pattern of life" is most often determined by early pampering. The child becomes dependent instead of self-reliant, and resists, often with great intelligence, any effort to curtail its special privileges. As weapons it may select anorexia, enuresis or any other symptom that produces the desired effect on the parents. The desire of the child to remain in the atmosphere of love and pampering is due to an inferiority complex. This inferiority complex is the motive for resistance against any change in the home environment or a shift to a strange environment. It may also explain the hatred that a child may develop against a parent who tries to curtail pampering. But no formula such as this explains all cases. The physician should endeavor to comprehend the total personality of the child, his individuality — therefore, Adler's "Individual Psychology."

HUENEKENS, Minneapolis.

ECONOMIC STRESS OF MOTHERHOOD, AND SOME ECONOMIC, SOCIAL AND GYNECOLOGIC PRINCIPLES OF HUMAN PROCREATION. M. HIRSCH, Med. Klin. **27**:1889 (Dec. 24) 1931.

This paper is a lecture delivered at a meeting of the Berlin Medical Society, and as such cannot be easily abstracted, but a few axioms will be quoted here as they are particularly relevant in this time of depression.

Motherhood, more and more, means for the woman a facing of economic stress. This applies not only to unmarried mothers but also, or even more, to the married ones. Outside employment of the mother and motherhood are incompatible.

The mother and the child form an inseparable biologic and sociologic unit not only during pregnancy and childbirth but far beyond the actual process of birth.

The elimination of industrial occupation of the married woman outside of the home would serve the best interests of a healthy increase of population. Preg-

nancy, childbirth and puerperium have to be considered as conditions of increased danger for the woman. Difficulties in pregnancy, childbirth and puerperium of the employed woman should be considered as sickness from the point of view of health insurance. Motherhood is service by the woman to human society and to the state. Any country that leaves pregnant women and mothers in need forfeits the right to prohibit abortion and contraception. The right to such regulation will grow only out of complete protection given to every mother and child in need.

ZENTAY, St. Louis.

EMPLOYMENT OF CHILDREN IN POLAND. JANINA RYGMANOWA, Opieka nad dzieckiem **9**:285 (Oct.) 1931.

According to article 153 of the constitution, the employment of children under 15 years of age is forbidden. Before a child can be employed he must have a certificate, stating that he is over 15, the consent of the parents and a health certificate from a physician; moreover, the work must be light. According to the statistics of the Department of Labor the law is not observed in many instances, because of many factors. After the war, because of extreme poverty and a low wage scale children were compelled to work in order to help to support the family. However, many of these difficulties are now overcome because of help given to poor families and better supervision by the government.

KRUPINSKI, Chicago.

REPORT OF THE COMMITTEE OF THE FOURTEENTH CONFERENCE OF THE POLISH PEDIATRISTS IN LWOW, MAY 23 to 26, 1931. S. PROGULSKI, Pediat. polska **11**:289, 1931.

Prof. F. Groer was chairman and Dr. Progulski, secretary. One hundred and thirty-five physicians attended the congress. The program was elaborate. At the end of the session Professor Groer read a paper on his impressions of America where he had spent many weeks.

KRUPINSKI, Chicago.

BLOOD GROUPING AS PROOF OF PATERNITY. OLOF SIEVERS, Finska läk.-sällsk. handl. **73**:660 (Aug.) 1931.

The author discusses several theories of blood grouping and regards Bernstein's theory with its six groups to be of biologic and legal importance. According to this grouping, although paternity cannot be proved, the impossibility of a man to be the father of a designated child may be established. A great number of medicolegal judgments have been based on this test in Germany and the Scandinavian countries.

ELGHAMMER, Chicago.

VITAMIN SUPPLY OF FEMALES AND MALES: A NEW SEX DIFFERENCE. E. POULSSON, Norsk mag. f. lægevidensk. **92**:130 (Feb.) 1931.

After copulation has taken place, the male has no further part in the development of the embryo. This is probably the reason for the female being in need of a greater vitamin reserve than the male. This supposition was shown to be true by the work of Birnbacher. Of 330 cases of hemeralopia, 38 (11.5 per cent) occurred in women. Between the ages of 1 and 5 years this disease was equally distributed between boys and girls. Between the ages of 5 and 10 it occurred more frequently in boys, and between 15 and 30 years it occurred in 2 women and 105 men. Pregnant women were not considered, as pregnancy increases the disposition to the disease. The author considers the distribution of hemeralopia as a sign that the female has a greater vitamin reserve than the male, and that this reserve probably lies in the subcutaneous fat. He has found this to be true of the vitamin A supply of animals. Cow fat, for instance, is richer in vitamin A than ox fat. The author has also found a similar distribution according to sex in human beings.

TOVERUD, Oslo, Norway.

Society Transactions

PHILADELPHIA PEDIATRIC SOCIETY

Frederick A. Packard Memorial Lecture, April 12, 1932

JOHN P. SCOTT, M.D., *President, in the Chair*

THE PSYCHOLOGIC ASPECTS OF NUTRITION IN CHILDHOOD. Presented by DR. JOSEPH BRENNEMANN.

The adult, through experience, has learned the necessity of conformity to conventions; the child is by nature a nonconformist. Whether or not he shall remain one depends largely on the extent to which the psychologic aspects of eating are recognized and utilized in guiding him from early infancy to adult life. He is keenly sensitive and largely molded by his environment. His wants and desires are unbridled, and he resents interference with his pleasures. He is swayed and often dominated by emotions the gratification of which will lead him to refuse to satisfy such fundamental urges as eating. He is a queer little bundle of psychology, whose mysteries the psychologist and child guider have not fully fathomed. He may have only three primitive instincts in the laboratory, but he has an amazing psychologic repertoire in the home, his natural habitat; there only can he be observed to full advantage. He is a thinking, preferring, interpreting, emotional little tyrant, with strange, often inexplicable and unpredictable vagaries in his little psychology that, if unheeded, nullify many scientific admonitions.

A child often carries through life the ineffaceable imprint of habits acquired in the nursery. During the first three months an infant will go from breast to bottle and from bottle to breast without choice. From the third month on, choice plays an increasingly prominent rôle. At the fifth month it is commonly difficult, but usually possible, to change a baby from breast to bottle feeding abruptly, or from bottle to breast feeding, if it has not been accustomed to the alternate method of feeding. The difficulty increases rapidly during the succeeding months, and the ninth month may be placed as the dividing line beyond which it is not only useless but even undesirable to waste time in trying to make the change. In changing a marantic infant from the bottle to the wetnurse, when he is beyond the workable age, much time can be saved by drawing off the milk and giving it in the accustomed manner. Babies who refuse the bottle after having been breast fed for six months or more may be headed for serious trouble, which could have been prevented by earlier training.

On the author's first visit to a new-born baby he stresses two points to the mother: to accustom the baby to a bottle from the start and never to force the child to eat. If the child refuses plain water from a bottle, there is no objection to adding a small amount of cane sugar for a time, or 1 grain (0.065 Gm.) of saccharine to a quart of water, gradually lessening the amount. The feeding of a bottle of milk is begun at the third or fourth month to insure smoothness of adjustment; this should be offered more in play than by force or with too much coaxing. The food must be made to taste approximately like mother's milk. The feeding of cereal from a spoon is started at the third month. There is at first a little difficulty in giving food by spoon. Force and undue coaxing play no part. The addition of some milk from the bottle to insure a familiar and acceptable taste and a sprinkling of cane sugar at the start overcome the initial difficulty. To yield to resistance by putting the cereal in the bottle misses the point and purpose of the procedure and makes it all the more difficult at a later period. At

the fifth month, sieved vegetables in the form of a purée can be fed by spoon. From the seventh to the ninth month coarser foods are introduced, and the purée is continued, but at least half the time vegetables are offered; these are merely mashed with a fork, for psychologic reasons. This change extends to milk toast, coarse and dry cereals, puddings, scrambled eggs, very ripe bananas, stewed fruit, dry toast, zweibach, crackers, and even, on occasion, to scraped or finely chopped beef. If this change is delayed beyond the ninth month, it may be difficult to teach the child to eat anything that is not finely divided. Disinclination or inability to take coarser, adult table food has large possibilities for maladjustment, from the standpoint of both nutrition and behavior. The baby should be taught to take milk from a cup at not later than the end of the first year. If he does not take it well, continue giving a bottle in the morning and at bedtime into the second year, letting him take what milk he will from the cup and in his food at mealtime. In this manner the way is paved for feeding by cup alone at a later time, when he may be more reasonable, and it assures him at least a pint of milk a day.

Some babies do not like orange juice; not a few vomit after taking it. If this dislike has an allergic or some other intractable basis, then it must be stopped, and other fruit or vegetable juices must be substituted. The mere dislike of orange juice often disappears when the orange juice is put in milk. When administration of cod liver oil is begun in the first month and continued daily, babies like it. Avoid putting it in the bottle, as it may cause a dislike for the bottle. Forcing oil from a spoon may start a conditional reflex against all food from the spoon. If the baby objects too seriously to cod liver oil, then viosterol or irradiated foods should be substituted.

Many babies are born in hospitals. Because of the well known effect of nervousness and worry on a mother's milk supply, she is often hedged about by a conspiracy of silence, which she quickly senses; this silence is far worse in its effect than would be an evident frankness about any minor, remediable trouble with the baby or herself. The effect of a nervous mother and a nervous environment in the home on both the child's disposition and on his nutritional progress is well known. An analogous condition presents itself in an infant ward in a hospital or in an orphan asylum. The ward presents a striking contrast to a normal, peaceful home in the number of noises and disturbances to which the baby is subjected. Meyer and Jahr have demonstrated their belief that the many psychic disturbances of an infant ward lower the threshold of tolerance to the invasion of the new and manifold bacterial flora to which the child is subjected in the hospital.

Anorexia was rare thirty years ago; today it is most common. This condition is so fantastically unnatural, so amazing a biologic phenomenon — the majority of the young of any animal refusing to eat normally — that it presents a challenge and demands an explanation. The child that will not eat is a problem, a maladjustment that inevitably ramifies far beyoung nutritional confines. Many and various explanations of one physical basis or another have been offered. In the absence of any one ascertainable physical cause or combination of causes, one is forced to believe that the essential factor is psychologic. There is abundance of evidence to support this view. The immediate pathogenesis of the psychic anorexia seems to lie in an abnormal stimulation of two normal human traits by an external irritant. The first trait — negativism — appears, *ad maximum*, though normally and innocently, in the child that has not been mellowed by the inhibitions of convention. The second trait is a desire for the spotlight, to be distinctive, to wield power over others or to elicit sympathy. The external irritant is the mother, the nurse or the father, who tries to make the child eat what, when and as he thinks it ought to eat.

On the other hand, the little tyrant resolutely holds the fort, either refusing to surrender or capitulating only on his own terms. Two of his most powerful weapons of defense are vomiting and dawdling. In some instances the basis of the trouble is possibly a conditional reflex.

The therapy of anorexia is divided into prophylactic and curative, after the condition has been established. These procedures furnish final proof that anorexia is a matter of psychologic and not physical factors. The prophylaxis of anorexia can be expressed in one sentence: No child should ever be forced or coaxed to eat. This applies to any age, except the first few days of life, and there are exceptions in the case of severe illness. The cure of anorexia encounters many obstacles. The child's environment, of which his mother or nurse are the two most important factors, must be changed. The surest and most rapid cure is to send the child to a summer camp, a foster home or to relatives at a distance; or the parents should take a long vacation, leaving the child alone with a strange nurse. Her method of approach to the child may be one of feigned indifference or it may be one of employing to the maximum the therapeutic value of strangeness and simply, naturally and firmly assuming that the child will eat because eating is the thing to do. If no radical change in environment is feasible, the situation is explained to the mother. She must appear utterly indifferent to whether or not the child eats; she must place his food before him without question and, after sufficient time, clear the table whether he protests or not. Another method is to give him small helpings, increasing them only as he eats more, not because he demands more at first. The aim of both methods is to enlist the child's negative attitude in favor of eating instead of against it. The motive and all anxiety must be concealed. Eating with others, especially with others of like age, promotes appetite; eating alone depresses it. A further dash of psychology centers about choice and surprise. Children love surprises. It seems important to allow children a large freedom of choice and of variety of food. They have waves of appetite of widely variable lengths in the presence of a free and wide choice of food. They may eat mostly meat one day, chiefly vegetables the next day and so on; their diet tends to balance by the week and not by the meal. This is not the psychology of the books and of the platform; it is the simple psychology of the home that lies an open book before us in daily practice. Therein the pediatrician has a point of vantage that the psychologist, psychiatrist, mental hygienist and the child guider do not have in quite the same way.

Stated Meeting, May 10, 1932

JOHN P. SCOTT, M.D., *President, in the Chair*

ALLERGY IN RHEUMATIC FEVER. Presented by DR. CHARLES H. HITCHCOCK, Philadelphia and DR. CLIFFORD L. DERICK, Boston.

During the first five years of life, dermal allergy to streptococcal products (filtrate or nucleoprotein) is uncommon, but by the time adulthood is reached the number of persons giving positive reactions in a hospital population is about 50 per cent. In certain diseases — rheumatic fever, glomerulonephritis, peptic ulcer, diabetes and gallbladder and thyroid diseases—the percentage of persons giving positive reactions reaches 90 per cent or more. Products of Streptococcus hemolyticus are more efficient in the detection of cutaneous sensitivity than are those of Streptococcus viridans or indifferens. A similar allergic state can be induced in rabbits by the intradermal injection of very small doses of living nonhemolytic streptococci. Such rabbits show cutaneous and ocular sensitivity, and succumb when treated intravenously with certain doses of cultures which are innocuous to normal animals. This condition is comparable to tuberculin allergy in a tuberculous animal. An opposite condition, that of immunity, may be induced by the administration of the cultures by the intravenous route. Allergic animals may be desensitized and rendered immune by carefully spaced and graded injections of cultures. Both allergy and immunity lack type specificity in the serologic sense.

When attempts are made to desensitize patients by the administration of streptococcal vaccines or nucleoproteins intravenously, general or focal reactions may occur in the presence of disease usually associated with streptococcal infection (rheumatic fever and glomerulonephritis). These may be compared with the reactions caused by tuberculin in a tuberculous patient. They are not elicited in diseases unassociated with streptococcal infection (e. g., peptic ulcer), despite the existence of marked dermal allergy in such patients. By the use of carefully spaced and graded intravenous injections, many patients may be more or less completely desensitized. This desensitization is usually accompanied by clinical improvement. The ultimate value of this treatment is yet to be determined.

Dermal allergy alone is insufficient for the production of focal or general reactions with streptococcal products. The additional factor of active or recent infection is necessary. Streptococcal allergy may be regarded as the groundwork without which the active rheumatic process would be unable to develop. No lesion which may be regarded as specifically rheumatic has as yet been produced in an allergic experimental animal. The nature of the rheumatic process is still a field for investigation.

THE NATURAL HISTORY OF RHEUMATIC FEVER IN CHILDREN; ITS RELATION TO THE EVALUATION OF THERAPEUTIC PROCEDURES. Presented by DR. MAY G. WILSON, New York.

Recent investigations concerning the rôle of streptococci in rheumatic fever have renewed interest in the use of serums and vaccines for prophylactic and therapeutic treatment. It has not been possible, by any immunologic reaction or skin test, to judge the influence of these measures or to identify the rheumatic child. Evaluation of any therapeutic procedure is, therefore, dependent on a consideration of its influence on the clinical course of the disease. This is difficult, since rheumatic fever is varied in its manifestations, apparently self-limited in its acute stages and characterized by recurrences.

Data on the natural history of rheumatic fever obtained from a statistical analysis of a large series of clinical records covering the duration of the disease from the onset would serve as a basis for comparative analysis. Such a study has been attempted, and the following significant facts on the natural history of rheumatic fever in children have been collated from an analysis of 413 clinical records of children observed over periods of from one to fifteen years. A consideration of the clinical course experienced by each of these 413 children shows that the various manifestations (growing pains, arthritis, carditis, chorea and nodules) occurred interchangeably, and were not directly related to the duration of the disease or to the ultimate type or degree of cardiac involvement. One is impressed by the chronicity of the disease; yet for a patient to experience one, two, five or more years of freedom from recurrence, followed by a relapse, is not unusual. This should be considered in the evaluation of therapeutic measures.

Beginning with preschool ages, the curve gradually rises to the age of about 6 years, remains high up to the age of 9, and declines thereafter. It is obvious that prophylactic measures (were it possible to identify the rheumatic child) would have to be instituted at least before the age of 6 years. That age is an important factor to be considered in judging the influence of therapeutic measures, such as tonsillectomy, convalescent care and treatment with vaccine or serum, is indicated by the following: Frequency curves showing the manifestation of activity at various ages in 413 children, from 1 to 19 years of age, showed an increasing number of infections up to the ages of from 9 to 12 years, and after this age period a diminished number of recurrences. This may indicate an age period of susceptibility and an age period of resistance or immunity (as judged by the incidence of recurrences at these ages). It is obvious that the results of any therapeutic measure, instituted before or after children have reached the ages of from 9 to 12 years, must be judged accordingly. Studies that include adults are not comparable to those limited to children.

The incidence of involvement of the heart in any series of rheumatic patients varies with the method of examination, the criteria used and the period of observation. In this series it was found that 63 per cent had definite heart disease within one year of the onset and 75 per cent in less than three years, and at the end of the period of observation, 91 per cent showed evidence of heart disease. It is a frequent experience to fail to elicit murmurs previously present, but that in itself does not indicate that damage to the heart did not occur or is not still present. It is probable that the heart is always affected at the onset of the disease, although this may not be detected clinically. The degree of damage to the heart and the incidence of single or multiple valvular lesions in this series of patients seemed to be directly related to the severity and number of the rheumatic episodes. It would seem more accurate to speak of the prevention of rheumatic recurrences than of the prevention of rheumatic heart disease.

Evaluation of therapeutic measures instituted during the acute stages of rheumatic fever must take into consideration the fact that these manifestations are apparently self-limited, varying in duration and severity. Prompt recovery, long continued activity or fatal outcome may occur in any one attack. Evaluation of any therapeutic measure should be based on a series (including controls) large enough for statistical analysis.

DISCUSSION

DR. JULIAN M. LYON: Dr. Hitchcock and Dr. Wilson have worked long and hard in the study of rheumatic fever, the former from the laboratory point of view and the latter from the clinical. Dr. Wilson brought out a fact that is of special interest, namely, that in practically every case of rheumatic fever there seems to be some cardiac involvement and that as attacks recur and become more severe, the amount of cardiac damage increases. The age incidence emphasized by Dr. Wilson should focus one's attention and efforts on the prevention of recurrences during this period.

DR. S. C. COPELAND: What is the present thought as to prognosis in rheumatic fever?

DR. W. D. STROUD: The physicians who are working at the Children's Heart Hospital owe Dr. Wilson a debt of gratitude for her statement as to the percentage of cardiac involvement in rheumatic fever. For the past ten years, my associates and I at this hospital have been trying to have children with the earliest manifestations of rheumatic cardiovascular disease sent to the Heart Hospital, and we are gratified to find that more and more children are being sent after their first manifestation of rheumatic cardiac involvement. Generally speaking, the earlier the treatment, the more benefit one may expect. I believe that every one present realizes from Dr. Wilson's figure of 91 per cent that one is safe in expecting that almost every child who has had rheumatic fever will sooner or later have cardiac involvement. We have given convalescent care, after an attempt to remove the foci of infection, to about 500 children with rheumatic cardiovascular disease during the past ten years. Thirty-four per cent are dead or totally incapacitated owing to cardiovascular disease; 30 per cent are working or going to school, and we have insufficient follow-up data on the other 36 per cent. We have been discouraged by these results. Our type of treatment is similar to that carried on by Dr. Duckett Jones at the Good Samaritan Hospital in Boston, by Dr. Hugh McCullough in St. Louis, and by others. We were much interested in Dr. Homer Swift's suggestion that these children might be desensitized to streptococci through intravenous vaccination. One year ago Dr. Swift supplied the Pennsylvania Hospital with a triple streptococcus vaccine. Thirty patients with rheumatic cardiovascular disease were chosen, 10 as controls, 10 to be given triple typhoid vaccine intravenously and 10 to be given triple streptococcus vaccine. This is a small group, and it is open to the criticism that interpretation of results should be based only on a large series of cases. During the first year's observation, Dr. Bromer and Dr. Gallagher, who were in charge of this work, felt that

the results in all three groups were about the same. We were criticized by Dr. Swift in that we did not take steps to determine whether or not we were desensitizing these children.

Is it possible to determine whether these children are desensitized through their cutaneous reactions, determinations of sedimentation time, changes in P-R intervals and observations as to the general clinical condition of the patients? We hope that Dr. Thorpe will continue this study at the Children's Heart Hospital. I should like to ask Dr. Hitchcock and Dr. Wilson if they feel that one is justified in doing this in children under 12 years of age? Is one justified in continuing intravenous vaccine therapy? Should a single type of streptococcus or a triple vaccine be used? What type of intravenous vaccine do they feel that one is most justified in using?

DR. A. W. BROMER: The question of dosage of vaccine is of the greatest importance. In our study only 4 of the 10 persons given triple streptococcus vaccine had slight immediate reactions; on the other hand, smaller doses of triple typhoid vaccine precipitated definite immediate reactions in every member of the typhoid group. Another point pertains to the length of the period of increased resistance effected by intravenous streptococcus vaccination. In each of the three groups, viz., the groups given streptococcus vaccine, the groups given typhoid vaccine and the control group (unvaccinated), three patients had acute rheumatic exacerbations during the year following the vaccination period. The flare-ups in the group given streptococcus vaccine occurred in March and April, 1932, approximately nine months after the course of injections of vaccine. This raises the question as to whether another course of vaccine should have been given six or nine months after the first.

Dr. Wilson's remarks regarding the evaluation of symptoms have impressed me very much. Not uncommonly, it is extremely difficult to determine whether or not certain symptoms are an expression of rheumatic activity. In the group of unvaccinated controls, there is a 16 year old girl who complained of pains in the joints, palpitation and occasional slight fever, and whose weight remained unchanged for a period of nine months prior to August, 1931. During the eight months since that date, when salicylates were prescribed, she has been symptom-free and has gained 13½ pounds (6.1 Kg.). Had she been in either of the two vaccinated groups, it would have been impossible to determine how much of the improvement had resulted from the injections of vaccine.

As mentioned by Dr. Stroud, a question might be raised as to whether or not the small number of cases in the study justifies the drawing of definite conclusions. It has been the aim to have but two or three physicians follow in detail the clinical course of every member of each group, and thereby facilitate the summarization of results. In the final analysis, streptococcus vaccine in the dosage in which it is administered intravenously has not proved to be of benefit in diminishing the incidence of acute rheumatic exacerbations.

DR. CHARLES H. HITCHCOCK: I shall try to answer Dr. Stroud's questions, as far as I am able, with reference to desensitizing patients with vaccine and the whole matter of desensitization and whether one is justified in continuing it. I hope I made my position clear that there is a great deal of doubt in my mind as to just how far one is justified in applying the principles of allergy to rheumatic fever. Allergy is present, but has it anything more to do with the mechanism of the disease than to supply the foundation on which rheumatic fever develops. As to complete desensitization, I have never, among a number of treated persons, seen one in whom the reaction of the skin became entirely negative. I have seen the reaction reduced in patients who have been free from evidence of active respiratory infection for some time. It is conceivable, then, that the diminution in allergy might be due to the freedom from infection rather than to the treatment with vaccine. Experimentally, in animals, my associates and I are able to remove sensitization, but we are working with nonvirulent strains. I think that the best index we had was when, after a series of treatments, our patients failed to show

the local or focal reactions which they presented at the beginning of the course. We had patients who reacted violently to 100,000 streptococci at first and later could stand a dose of 50,000,000. Most of these patients improved, but I do not know whether the improvement was due to the vaccine, to a diminution in allergy or to some other cause. I think that Dr. Stroud and his co-workers are justified in continuing the treatment. It apparently does not harm the patient; not much is known as yet about its effects, and all the information that can be secured is needed. I should like to emphasize that one must continue this study of vaccine over a period of years and in a large number of patients in order to get material that can be analyzed. As to whether single or triple vaccine is better, the last year that I was in New York my associates and I used triple vaccine. The results were apparently not quite so good; that is, patients manifested reactions for a longer time than they did when monovalent vaccine was used. Monovalent and triple vaccines were used in different years, which may account for the lack of uniformity of results. There is a little laboratory evidence, however; that is, an animal sensitized with one strain, when treated intradermally with a heterologous strain, suffers more destruction of tissue than he does when treated with the homologous strain.

DR. MAY G. WILSON: My associates and I attempted to analyze the results of our studies from the point of view of prognosis. It is rather interesting that the children in whom the onset of the disease occurred either very early or around the age of 11 years seemed to have a greater number of recurrences within a year, and the mortality was highest at about the age of 11 years. It may be that puberty is a rather dangerous period. I have always felt that when a child passes the twelfth and thirteenth years, the chances are that there will be no further recurrences. We have been fortunate to observe some patients up to the age of 25. When recurrences diminish, the ultimate prognosis, as far as we have been able to observe, seems to be good. With reference to the evaluation of intravenous vaccine therapy, we have just completed a second study, the results of which have not as yet been published, in which a series of patients were treated with typhoid vaccine and with autogenous vaccine. I do not feel that our results indicate that this is a therapeutic measure, but I believe they warrant further investigation. Additional studies should include only children of a susceptible age — 6 years and under — and the series should be large enough for statistical analysis. We did not find any difference in the incidence of chorea or of other manifestations in the treated and in the control group.

INTERNATIONAL SOCIETY FOR CRIPPLED CHILDREN, ABSTRACT OF REPORT OF COMMITTEE ON PREVENTION AND RESEARCH

April 18, 1932

F. D. DICKSON, M.D., *in the Chair*

The Committee on Prevention and Research of the International Society for Crippled Children endeavored to learn how much had been accomplished by way of research and prevention of crippling in childhood. "Wherever, in different parts of the country, the ravages of epidemics, increases in child labor, and the onslaught of depression have been felt, an effort has been made to secure authentic information regarding the status and value of combative measures used. A study of recent literature depicting the laboratory findings of those engaged in searching out means of prevention has been made."

POLIOMYELITIS.

"Dr. R. I. Harris of Toronto estimates that poliomyelitis is one of the most important causative factors of crippling, averaging 40 per cent of the cases, while tuberculosis follows with an average of 30 per cent. In the year 1931 there were reported some 13,000 infantile paralysis cases, one third of which occurred in New York City. Between July 1 and September 12 there were 332 deaths. A study by Lent D. Upson, Director, Detroit Bureau of Governmental Research, and Opal V. Matson, made in Michigan, and published in 1931, has ascertained that 'Infantile paralysis was found to be responsible for the crippling of one third to two thirds of the seriously handicapped children appearing at the clinics.' The State Commission on Physically Handicapped Children in Illinois reported that of more than 10,000 handicapped children located by them, infantile paralysis was responsible for 2,308, or nearly a quarter of all cases. . . .

"Infantile paralysis recurs each year in differing degree, usually during the summer and early fall. It works apparently through an ultramicroscopic virus. . . . As in other communicable diseases, it is believed that there are many mild and abortive cases which are unreported. . . .

"It has been established that one who emerges the victor after one attack is immune to others. This led naturally to the belief that the blood of such cases might help to counteract the disease in nomimmunes. Recent experiments, however, have not fulfilled completely the earlier promises. Two difficulties have been met: one, to produce the serum in sufficient quantities for widespread use in the face of an epidemic, as its preparation in animals has not been perfected; another, to discover or be apprised of the illness early enough for the serum to be most effective. . . .

"Most students of the disease say that it is communicable and is most commonly spread from secretions of the mouth or nose in the early stages of the disease. Human beings, often themselves immune, are carriers. It has never been established conclusively that animals or insects carry it. . . . It is, as a rule, possible to diagnose the frank cases of infantile paralysis if all laboratory and clinical tests are applied carefully. Only before paralysis itself takes place, and by means of speedy treatment, is it possible to prevent or to lessen the crippling.

"Treatment so far has been, for the most part, the injection of convalescent serum. Experiments on monkeys and observations on human beings gave rise to discovery of this method of treatment. Apparently monkeys are the only animals found so far to react to the virus in practically the same way that man does. . . . The serum can be preserved in the laboratory under proper conditions for months and even a year or two without losing its effect, it has been stated. . . .

"According to Wywer, Park, and Banzhof, in the April, 1931, issue of the *Journal of Experimental Medicine,* while 'Pooled serum from "normal" adult donors has proved effective in neutralizing virus, its potency is approximately one half that of convalescent serum.' But again the question is, may not these so-called normal people be those who had infantile paralysis in their youth, but who escaped without serious enough injury to be noted? . . .

"A study made by Dr. Frank Oldt during the 1927 epidemic in Ohio is of interest here. In a village of 900 inhabitants, where only 5 cases of paralysis and one abortive case were reported, he visited every home in the village and personally questioned or examined each individual. He found in 90 families of 280 individuals over 16 years of age and 253 children, 223 had in some way been affected during the epidemic. One case had been fatal, 12 were paralytic, 38 were considered abortive cases, 45 remained with abnormal reflexes but gave no history of having been ill, and 127 had had some illness at the time of the epidemic, such as a mild digestive disturbance, a transient fever, headache, or perhaps a sore throat. These were classed as suspected cases. In 250 families with no history of attack, there were 305 adults and only 33 children under 16 years of age. . . .

"One fact not fully understood is, why should there be an epidemic in one place and not in another? Several suggestions are offered. One is that in a place where occurrence of attack goes on yearly there is only a comparatively new crop of susceptibles, while in places where occasional 'epidemics' occur there have apparently congregated several years' crops of susceptibles. . . .

"'An analysis by the U. S. Public Health Service shows that throughout the greater part of the country about 1 paralytic case per 100,000 population may be expected between December 1 and June 1 of each year, and in the other six months about 4 to 14 cases. The maximum of paralysis is reached in September. . . .

"'Draper first pointed out indications of physiologic imbalance in persons attacked by poliomyelitis. This would suggest that some such failure of the body to meet the stress of seasonal adjustment may be the factor responsible for the individual predisposition which determines the frequency with which initial exposure to the virus of poliomyelitis produces the paralytic diseases rather than immunization without recognizable signs of the disease. In other words, there would appear to be a form of resistance distinct from that which arises from exposure to the virus (immunity) which determines the result of an individual's first exposure. . . .'

"At the end of the infantile paralysis season, three Stanford University men, Dr. Charles Eglof Clifton, Edwin William Schultz and Louis Philipp Beghardt, announced that they had isolated and measured an organism which they were certain caused infantile paralysis. They reported the organism as measuring less than one-half millionth of an inch. They figured the size by filtering material from a case of infantile paralysis through the pores of unglazed, fine porcelain; the size of whose pores had been determined. The filtrate when injected in monkeys caused the active disease in them. . . .

"Studies of Dr. Frederick Eberson at the University of California are of interest. He has been able to segregate germs and produce a serum that checks infantile paralysis in monkeys, he reports, though he is not prepared to vouch for its success with human beings. . . .

"Miss Edna Foley, a member of this committee, says, 'I am not sure that we know any more about the prevention of poliomyelitis than we did, but certainly we know a lot more about the prevention of deformity, the protection of weakened muscles, and the restoration of strength to paralyzed muscles by proper treatment. . . .'"

TUBERCULOSIS.

"Regarding tuberculosis of the bones and joints, Dr. Maxwell Harbin of Western Reserve University sounds an optimistic note, 'To date there has been a steady decrease in incidence of tuberculous disease of bones and joints in childhood, although it is my impression that there has been an increase in the incidence in adults. It would seem that the children have perhaps been protected partly by public health measures and that we are beginning to reap benefit from this source. Later, perhaps, with the letting down of public health activities, which may occur as a result of the depression, this situation may be changed.'

"This opinion is held by a number of other investigators throughout the country. Certainly not so many or so serious cases of tuberculous bone and joint disease are seen in the wards of our hospitals as were a decade or two ago. . . .

"Further studies are being made in line with the findings of Cunningham, Sabin, Sugiyama and Kindwall, in 1929, wherein they determined that, 'The infection of tuberculosis causes an overproduction of the monocyte, including all of its stages, namely, the reticular cell, the typical monocyte and its two derivatives, the epithelioid cell and the giant cell. . . .'

"The uncertain and unfortunate results obtained by the Calmette method of immunization have given a setback to its trial in the United States.

"It is recognized that other communicable diseases may account for some of the crippling, but these constitute a small proportion of the total. Syphilis now comes under surveillance earlier than formerly and is more intensively treated. Diphtheritic paralyses are gradually fading out of the picture due to the exact knowledge we have of this disease as to cause, prevention and cure.

"A relatively small amount of crippling has occurred in this country because of encephalitis lethargica, although it is a devasting disease in other respects."

Cerebral Palsies and Birth Injuries.

"While there is some scattered experimentation of promising value going on at present for the prevention of cerebral palsies and birth injuries, little of note has appeared concerning these subjects the past year. Dr. Maxwell Harbin says, 'The Prevention of Erb's and Erb-Duchenne's palsies lies largely in the realm of the obstetrician who delivers the child. . . . It should be emphasized in the teaching of medical students as well as the instruction of internes in hospitals where there is an obstetrical service. . . .'

"Dr. Helen MacMurchy believes, 'It would seem that the chief means of prevention of these injuries is in better obstetrics and in the better education of the public. . . .'

"Dr. E. C. Hartley thinks that, while the question of birth injuries 'may be met in part by better obstetrical care, there is still a background of which at present we know nothing, but which must be understood in order to make any great impression upon the incidence of birth injuries.' He refers to 'a peculiar susceptibility which some children appear to have for injury at birth,' into which he believes 'some constitutional or other factor enters to render some children more liable to birth injury than others.'

"Miss Foley questions whether 'birth palsy is not considered by some the result of prenatal conditions over which the obstetrician has no control,' and asks whether 'it is fair to attribute every spastic baby to bad obstetrics. . . .'

"Dr. Fred L. Adair has been studying the subject of obstetrical birth injuries, in Chicago, and at Harvard, Bronson Crothers has been interesting himself in the neurological aspects of such injuries. Neither of them has completed his work, but the quality and extent of their investigations promise much for future preventive methods."

Rickets and Nutritional Disorders.

"Deformities from rickets are among the most common and at the same time the most needless of any known. That the present period will see an increase in this type of crippling seems not at all improbable, although education has increased widely the use of protective means up to this time. At one health center in New York City, where the percent of undernourished children has been carefully diagnosed during the past three years, it is reported that malnutrition has increased from 18 to 60 per cent since 1928. Public health nurses report that their work is handicapped because parents cannot provide their children with the diet recommended. In Louisville, Ky., one agency reports a decrease of 1,000 in the number of children able to meet the health and weight standards. A recent survey in the United States discovered 5,000,000 cases of malnutrition in children — almost one fifth the entire number of school children in the country — and this was just prior to the present period when so many heads of families are unemployed. Any extensive data regarding conditions arising from malnutrition cannot be secured at present, and perhaps it will be difficult to do so at the close of the present economic period. There can be little question, however, regarding the findings of school examiners, pediatricians and general practitioners in this respect during coming years. . . .

"Unobstructed sunshine is the cheapest and most effective of any of the elements discovered. But in smoky, foggy cities the alternative is diet control and the use of potent cod liver oil. The ingestion of a diet rich in calcium, phosphorus

and vitamin D usually results in a definite change within a period of from ten days to two weeks. Increased deposition of calcium and phosphorus salts in the bone may be discernible by roentgen examination in about the same length of time. The ultraviolet lamps on the market should be used with caution, however, and under the direction and supervision of a physician. . . ."

CHILD LABOR.

"The Committee on Education and Training of the White House Conference learned that, 'Although 15 states and the District of Columbia apply the minimum age provisions to all gainful employment, and 28 to a more or less comprehensive list of employments, 5 set no minimum age except for employment in factories and certain dangerous or hazardous occupations, and 2, none except for certain dangerous or hazardous occupations. The various kinds of domestic and personal service, agricultural work and factory work in the home are usually unregulated by child labor laws. In some states canneries are exempt from the operation of the child labor law. . . .'

"There is need for education of the public regarding labor hazards, particularly for parents, children, and employers. Not only should the value of the laws regulating labor for minors be inculcated, but there should be some regulation as to the use of money given minors as compensation for injuries, so that it will be used for rehabilitation instead of being frittered away, or going to the general family aid in the case of needy families. Furthermore, parents and children must be instructed regarding their rights under the compensation laws; it has been ascertained that in many cases ignorance about how to apply for their compensations, where to receive medical care, and like matters has delayed action on the child's behalf. . . .

"Most of all, the Committee is in agreement with the findings of the White House Conference, that a national minimum standard regulating the employment of minors should be established in order to eliminate the inequalities and injustices existing between the differing laws of the states."

ACCIDENTS.

"Safety campaigns have been in evidence for some time. The greatest efforts have been directed toward schools, for it is there that the child is most available and open to all kinds of education. In 1931 a *Guide Book for Safety Education*, with a foreword by William John Cooper, United States Commissioner of Education, was published with the aim of offering school children, from the kindergarten up, interesting educational material on safety. In larger cities school patrols have become a part of the regular policing function, and in some rural communities they are coming into use.

"In spite of the precautions taken, statistics from many parts of the country reveal that the highest average accidents in any age group is found among children under 16 in trade, and next among causes of accident, automobiles and other motor vehicles have the highest severity. Machinery has caused the greatest number of accidents it is reported in Illinois, and also in Ohio, among employed minors the past year. The Metropolitan Life Insurance Company states in its Bulletin of October, 1930, that of automobile accidents involving 100,027 pedestrians 17 per cent were children struck at play in the streets. It shows a definite increase in the past seventeen years of deaths from automobile accidents, for all ages, of 845.5 per cent. . . .

"Although a survey, during 1931, of the efforts to prevent crippling in children is both enlightening and encouraging, it does not fail to warn that such advancement as has been made, has been at the expense of continual vigilance. The mighty arm of progress must strike here and there at ignorance, carelessness, thoughtlessness, if the day is to be won for the child.

"While we have confined our report largely to crippling viewed as physical disability of the trunk and limbs, the Committee is fully aware that it has much

wider implications. Crippling in its widest sense should include children who are seriously malnourished, partially or wholly blind or deaf, and those who have major deformities of the lips, jaws, or teeth. To these might well be added the cardiac cases and those suffering from pulmonary tuberculosis. All of these, however, are considered in detail by other national and local organizations, and much worthwhile literature is available regarding the extent, causes, prevention and cure of these disabling conditions."

A copy of the full report embodying bibliography may be obtained from the Cleveland Child Health Association at a cost of five cents.

News and Comment

UNIVERSITY NEWS

Dr. Herbert E. Chamberlain has been appointed associate professor of psychiatry in the department of pediatrics, Division of Biological Sciences, University of Chicago. He is to start a child guidance clinic there.

GENERAL

Bequests.—The Institute for Crippled and Disabled, New York, has been given $10,000, the New York Infirmary for Women and Children $500 and the Babies' Hospital, New York, $2,500 by the will of Mrs. Adele G. Schiff.

The Children's Hospital, Columbus, Ohio, was willed $1,000 by Mrs. Ella T. Baker.

The New York Society for the Relief of the Ruptured and Crippled received $9,045 under the will of Mrs. Amelia Walter.

DEATHS

Dr. Theodor Hoffa of Wuppertal-Barmen, Germany, died recently at 60 years of age.

Book Reviews

Diabetes in Childhood and Adolescence. By Priscilla White, M.D., with a foreword by Elliott P. Joslin, M.D. Price, $3.75. Pp. 236, with 25 engravings and a colored plate. Philadelphia: Lea & Febiger, 1932.

White has had a unique opportunity in Joslin's clinic to study diabetes as it manifests itself in the child. This book is based on the study of 750 diabetic children treated between 1898 and 1931, 519 of whom have been under the care of the author since insulin has become available. It is estimated that the number of children in the United States with active or potential diabetes equals the number totally deaf, blind or incapacitated by heart disease. This review confirms the beliefs and observations of others, that, when properly controlled, diabetic children can grow, develop and live as essentially normal persons. In spite of the prevalence of the condition, its nature is such that the average physician is not adept at its care. This book should fill a sphere of great usefulness in familiarizing the medical profession with the potentialities of the child with diabetes. It presents the theoretical considerations of the disease, and their clinical application is discussed in a practical manner. Data from case records and from laboratory studies are used freely for illustrative purposes.

Heredity is given foremost consideration as an etiologic factor. A history of diabetes in other members of the family was obtained in 39 per cent of 533 patients; of the 123 patients aged 4 years or less, a positive family history was obtained in 47 per cent, and in the group of 72 diabetic children who had been under medical observation for ten years or longer, the familial incidence was 53 per cent. The data offered to indicate the etiologic significance of overheight for age are less convincing.

The following impressions are gained from the presentation: The diabetic child is potentially able to grow and to mature in a normal manner. Diabetic complications and degenerative changes are dependent largely on a lack of control of the disease. The greater part of the pancreatic pathologic process in the child is reversible. Diabetes in the child is more labile than that in the adult, and consequently the former is harder to keep under control. The degree of diabetes, as measured by the amount of insulin required, has been interpreted as mild in the majority of the author's cases. The child shows more evidence of nocturnal hyperglycemia than does the adult with diabetes; this is less noticeable in the early stage of the disease, but becomes apparent after the third year. A progressive increase of the dosage of insulin is to be expected throughout the period of growth; it is thought that this is dependent on the increase in bulk of the body tissues without an equivalent increase in the endogenous production of insulin. Infections increase the insulin requirement, but the author thinks that the effect tends to disappear completely after the infection subsides.

A rigid form of dietary regulation is not advocated, the requirements being adapted to the individual patient. Certain standards, however, are used as a guide in the prescription of a diet. From 2 to 3 Gm. of protein per kilogram of body weight is allowed, the larger amount for the younger child. Calories are restricted to from 40 to 50 per cent above the theoretical basal requirements. From 25 to 50 per cent of the calories are given as carbohydrate, from 10 to 20 per cent as protein and from 35 to 65 per cent as fat. Diets high or low in carbohydrate are not employed. The author discusses the human requirements for minerals and vitamins in health; she then dismisses further consideration by saying that by its nature the diabetic diet insures an adequacy of these factors. Clinically, the evidence of normal growth as noted anthropometrically and by the roentgen rays and the nonoccurrence of rickets, scurvy or xerophthalmia are offered to substantiate the adequacy of the diets. An analysis of the numerous illustrative menus for children from 1.5 to 14.7 years of age raises doubt as to the adequacy

of the menus in all regards. The diets for even the youngest children contain less than a pint of milk and cream per day, and the average allowance for the group over 5 years old was 180 cc. Cod liver oil was specified in only one diet. The value of the book would be increased if these illustrative diets could be made to approximate more closely the optimum for the normal child.

The use of insulin is advocated in all cases of true diabetes mellitus. The total dosage employed varied from 1 to 100 units daily. Of 317 children seen in 1930, two thirds received less than 40 units daily; only 2 received over 80 units. A 10 p. m. dose is used as a frequent routine procedure, to control nocturnal hyperglycemia.

Two instances of death in hypoglycemia are recorded. Thirty-six of the 54 deaths since 1922 are attributed to coma, although but 1 of these deaths occurred in the clinic. The chapter on coma seems particularly valuable. Alkalis are not used in the author's system of management, and her results substantiate her beliefs.

The book as a whole is well written and contains a large amount of valuable data. It merits careful reading by all interested in the field of applied nutrition and metabolic diseases.

Milk Production and Control. White House Conference on Child Health and Protection. Price, $3. Pp. 392. New York: Century Company, 1932.

Like the other reports coming from the White House Conference, this book is complete and broad. It takes up the question of milk and milk production from almost every standpoint, presenting practical and scientific data and suggesting means and ways by which one can fill the loop-holes.

The first chapter is on milk production and control with respect to the question of diseases transmitted through milk. Most of these difficulties, as is known, can be overcome by means of pasteurization. It then takes up the public health supervision of milk, but the readers of this journal will be more interested in the next chapter, on the nutritional aspects of milk, which is an elaborate, chemical consideration of milk.

The following chapter has to do with an adequate diet as regards milk, taking up the various phases of deficiency diseases, and likewise a consideration of the various chemical elements of milk from a physiologic standpoint. This is an excellent chapter.

The next chapter will also be interesting to the readers of this journal because it contains reliable data regarding pasteurized milk, dried milk, condensed milk and the like, giving an up-to-date estimate of the chemical and nutritive properties of these foods.

The following few chapters have to do with diet, and the last chapters with the economic and commercial aspects of the marketing of milk.

On the whole, the book is a continuation of the excellent reports one has learned to expect from the Conference.

La vaccination contre la diphtérie. By Robert Debré. Paper. Price, 25 francs. Pp. 141. Paris: Masson & Cie, 1932.

This book brings the various discussions on vaccination against diphtheria together in one volume. It contains a history of the early researches and an analytic study of the physical and biologic properties of toxin-antitoxin as compared to anatoxin. The methods of administration of anatoxin and the possible reactions and epidemic study are well discussed. It is of interest to note that the author does not believe in inoculations of anatoxin before the end of the first year, the ideal time being from this period to the sixth year. He believes that the subcutaneous introduction is the only advisable method. Three injections are the method of choice, of 1, 1.5 and 1.5 cc. The total time of injections should be three weeks, that is, nine days between the first and second injection, and twelve days between the second and third. These are minimum intervals; less than this diminishes the effect, while longer intervals cause no harm.

Behaviour Aspects of Child Conduct. By Esther Loring Richards. Price, $2.50. Pp. 288. New York: The Macmillan Company, 1932.

This volume of Dr. Richards' is well worth careful study by pediatricians. Every thoughtful practitioner must recognize that physicians in general have done relatively little in the way of cooperation with psychiatrists who are struggling with the problems of mental hygiene. Dr. Richards is one of the psychiatrists who knows how to make clear statements without sacrificing either dignity or truth. This volume is refreshingly free from mysticism or sentimentalism. The author is just as tired of the jargon of much of the mixed up literature as any of the rest of the medical profession. To any pediatrician who wants to find a good statement of the whole situation, this book is unreservedly recommended.

Physical and Mental Adolescent Growth. Proceedings of the Conference on Adolescence, Cleveland, Oct. 17 and 18, 1930, Brush Foundation and Western Reserve University. Opened by Robert E Vinson, Western Reserve University. Price, $1 (on application to Dr. Wingate Todd, 2109 Adelbert Road, Cleveland). Pp. 151.

This is a report of a conference held two years ago and contains many features of importance to those interested in the subject. The discussions are all by able men and women and represent an approach to this subject which has not been attempted previously.

Directory of Pediatric Societies

INTERNATIONAL

International Association of Preventive Pediatrics

President: Professor Taillens, Lausanne, Switzerland.
Secretary: Dr. P. Oltramare, rue Decandolle, Geneva, Switzerland.

International Pediatric Congress

President: Dr. George Frederic Still, 28 Queen Anne St., London, W. 1.

FOREIGN

Royal Society of Medicine, Section for the Study of Disease in Children

President: Sir Henry Gauvain, 125 Harley St., W. 1, London.
Secretary: Dr. E. I. Lloyd, 33 Wimpole St., W. 1, London.

NATIONAL

American Medical Association, Scientific Assembly, Section on Diseases of Children

Chairman: Dr. Frederic W. Schlutz, Bobs Roberts Hospital, University of Chicago, Chicago.
Secretary: Dr. Alfred A. Walker, Highland Plaza Apartments, Birmingham, Ala.
Place: Milwaukee. Time: June 12-16, 1933.

American Academy of Pediatrics

President: Dr. John L. Morse, 319 Longwood Ave., Boston.
Secretary: Dr. C. G. Grulee, 636 Church St., Evanston, Ill.

American Child Health Association

President: Dr. Samuel McC. Hamill, 1822 Spruce St., Philadelphia.
Secretary: Dr. Philip Van Ingen, 125 E. 71st St., New York.

American Hospital Association, Section on Children's Hospitals

President: Dr. Thomas B. Cooley, 7815 E. Jefferson Ave., Detroit.
Secretary: Miss Bena M. Henderson, 721 N. 17th St., Milwaukee.

American Pediatric Society

President: Dr. Oscar M. Schloss, 1185 Park Ave., New York.
Secretary-Treasurer: Dr. Hugh McCulloch, 325 N. Euclid, St. Louis.
Place: Washington, D. C. Time: May 8-10, 1933.

Association of American Teachers of the Diseases of Children

President: Dr. Ralph M. Tyson, 334 S. 21st St., Philadelphia.
Secretary: Dr. Oscar Reiss, 1930 Wilshire Blvd., Los Angeles.

Canadian Society for the Study of Diseases of Children

President: Dr. G. A. Campbell, 164 Metcalfe St., Ottawa, Ontario.
Secretary-Treasurer: Dr. L. P. MacHaffie, 162 Clemow Ave., Ottawa, Ontario.

Society of Pediatric Research

President: Dr. Bengt Hamilton, University of Chicago, Chicago.
Secretary-Treasurer: Dr. Charles F. McKhann, Harvard Medical School, Boston.

SECTIONAL

Central States Pediatric Society

President: Dr. Frank C. Neff, 406 W. 34th St., Kansas City, Mo.
Secretary: Dr. A. H. Parmelee, 715 Lake St., Oak Park, Ill.

North Pacific Pediatric Society

President: Dr. Herbert E. Coe, 509 Olive St., Seattle.
Secretary: Dr. Raymond H. Somers, Cobb Bldg., Seattle.

Southern Medical Association, Section on Pediatrics

Chairman: Dr. Horton Casparis, Vanderbilt University Hospital, Nashville, Tenn.
Secretary: Dr. Luther W. Holloway, 117 W. Duval St., Jacksonville, Fla.
Place: Birmingham, Ala. Time: November 16-18, 1932.

STATE

Alabama Pediatric Society

President: Dr. Thomas J. McElhenney, 1722, 2nd Ave., Bessemer.
Secretary-Treasurer: Dr. John W. Simpson, 1117 S. 22d St., Birmingham.

Georgia Pediatric Society

President: Dr. M. Hines Roberts, Atlanta.
Secretary-Treasurer: Dr. Roger W. Dickson, 33 Ponce de Leon Ave., N. E., Atlanta.

Louisiana State Pediatric Society

President: Dr. Cecil O. Lorio, 245, 3d St., Baton Rouge.
Secretary-Treasurer: Dr. Maud Loeber, 3503 Prytania St., New Orleans.

Medical Society of State of New York

Chairman: Dr. Brewster Doust, 605 Medical Arts Bldg., Syracuse.
Secretary: Dr. G. C. Sincerbeaux, 6 William St., Auburn.

Nebraska Pediatric Society

President: Dr. H. B. Hamilton, 434 Aquila Court Bldg., Omaha.
Secretary: Dr. George L. Clark, 1817 Vinton St., Omaha.
Place: As announced by committee. Time: Second Thursday of each month from October to June, inclusive, 6 p. m.

North Carolina Pediatric Society

President: Dr. Yates W. Faison, 121 W. 7th St., Charlotte.
Secretary: Dr. E. K. McLean, 121 W. 7th St., Charlotte.
Place: Various children's hospitals. Time: Twice a year.

Oklahoma State Pediatric Society

President: Dr. Clark H. Hall, 117 N. Broadway, Oklahoma City.
Secretary: Dr. M. J. Searle, 108 W. 6th St., Tulsa.

South Carolina Pediatric Society

President: Dr. T. D. Dotterer, 1512 Marion, Columbia.
Secretary-Treasurer: Dr. Julian P. Price, 117 W. Cheves St., Florence.

Texas Pediatric Society

President: Dr. Boyd Reading, 2201 Avenue D, Galveston.
Secretary-Treasurer: Dr. F. W. Hoehn, 1006 Medical Arts Bldg., Waco.

VIRGINIA PEDIATRIC SOCIETY

President: Dr. St. Geo. Grinnan, 925 W. Grace St., Richmond.
Secretary-Treasurer: Dr. J. B. Stone, 2042 Park Ave., Richmond.

WEST VIRGINIA STATE MEDICAL SOCIETY, SECTION ON PEDIATRICS

President: Dr. George M. Lyon, 955, 4th Ave., Huntington.
Secretary: Dr. M. F. Petersen, 1013 Quarrier St., Charleston.

LOCAL

ACADEMY OF MEDICINE OF CLEVELAND, PEDIATRIC SECTION

Chairman: Dr. J. E. McClelland, 10515 Carnegie Ave., Cleveland.
Secretary: Dr. P. G. Albrecht, 2009 Adelbert Rd., Cleveland.
Place: 2009 Adelbert Road. Time: Four meetings, from September to May.

ACADEMY OF MEDICINE, TORONTO, SECTION OF PEDIATRICS

Secretary: Dr. Lawrence Murray, 1870 Bloor St., W., Toronto.
President: Dr. Gladys Boyd, 56 DeLisle St., Toronto.

BRONX PEDIATRIC SOCIETY

President: Dr. Henry M. Eisenoff, 1018 E. 163rd St., New York.
Secretary: Dr. Morris Gleich, 9 Post Ave., New York.
Place: Concourse Plaza, 161st St. and Grand Concourse. Time: Second Wednesday of each month, except June, July, August and September.

BROOKLYN PEDIATRIC SOCIETY

President: Dr. Irwin Schiff, 658 Eastern Parkway, Brooklyn.
Secretary: Dr. Louis A. Koch, 62 Pierrepont St., Brooklyn.
Place: Kings County Medical Society Bldg. Time: Last Wednesday of each month, except June, July and August.

CENTRAL NEW YORK PEDIATRIC CLUB

President: Dr. Frank Vander Bogert, 111 Union St., Schenectady.
Secretary: Dr. Frank J. Williams, 58 S. Swan St., Albany.
Place: Various cities in New York. Time: Fourth Thursday of October, January and April.

CHICAGO PEDIATRIC SOCIETY

President: Dr. Archibald L. Hoyne, 25 E. Washington St., Chicago.
Secretary: Dr. Bert I. Beverly, 8 S. Michigan Ave., Chicago.
Place: City Club. Time: Third Tuesday of each month.

DALLAS COUNTY PEDIATRIC SOCIETY

President: Dr. Gordon B. McFarland, Medical Arts Bldg., Dallas, Texas.
Secretary: Dr. Harold T. Nesbit, Medical Arts Bldg., Dallas, Texas.
Place: Bradford Memorial Hospital. Time: 1 p. m., first and third Saturdays of each month.

DETROIT PEDIATRIC SOCIETY

President: Dr. Bernard Bernbaum, 5057 Woodward Ave. Detroit.
Secretary: Dr. Sarah S. Schooten, 5057 Woodward Ave., Detroit.
Place: Children's Hospital of Michigan. Time: No fixed date; approximately once a month.

FULTON COUNTY MEDICAL SOCIETY, PEDIATRIC SECTION (ATLANTA, GA.)

Chairman: T. Bolling Gay, 384 Peachtree St., Atlanta.
Secretary: Dr. Roger W. Dickson, 33 Ponce de Leon Ave., N. E., Atlanta.
Place: Academy of Medicine, 32 Howard St. Time: Second Thursday of each month from October to April, 8 p. m.

Memphis Pediatric Society

President: Dr. William R. Graves, 1193 Madison Ave., Memphis, Tenn.
Secretary-Treasurer: Dr. Harry J. Jacobson, 1193 Madison Ave., Memphis, Tenn.
Place: Memphis General Hospital. Time: Second Tuesday of each month.

Milwaukee Pediatric Society

President: Dr. G. H. Fellman, 231 W. Wisconsin Ave., Milwaukee.
Secretary: Dr. George F. Kelly, 161 W. Wisconsin Ave., Milwaukee.
Place: Children's Hospital. Time: Second Wednesday of each alternate month, beginning with February.

New England Pediatric Society

President: Dr. Lewis Webb Hill, 319 Longwood Ave., Boston.
Secretary: Dr. Gerald Hoeffel, 319 Longwood Ave., Boston.
Place: Boston Medical Library. Time: Four meetings a year, occurring from September to May.

New York Academy of Medicine, Section of Pediatrics

Chairman: Dr. Herbert B. Wilcox, 39 E. 75th St., New York.
Secretary: Dr. John Caffey, 50 Haven Ave., New York.
Place: New York Academy of Medicine, 2 E. 103d St. Time: Second Thursday of each month from October to May, inclusive, 8:30 p. m.

Northern California Pediatric Society

President: Dr. Edward B. Shaw, 384 Post St., San Francisco.
Secretary-Treasurer: Dr. Lloyd Hardgrave, 384 Post St., San Francisco.
Place: Various teaching schools. Time: Monthly.

Northwestern Pediatric Society

President: Dr. Irving McQuarrie, Dept. Pediatrics, University of Minnesota, Minneapolis.
Secretary: Dr. Alexander Stewart, 459 Lowry Medical Arts Bldg., St. Paul.

Philadelphia Pediatric Society

President: Dr. John P. Scott, 2040 Pine St., Philadelphia.
Secretary: Dr. John D. Donnelly, 115 Bryn Mawr Ave., Bala-Cynwyd, Pa.
Place: College of Physicians, 19 S. 22d St. Time: Second Tuesday of each month from October to June, inclusive.

Pittsburgh Pediatric Society

President: Dr. Henry C. Flood, 119 S. Highland Ave., Pittsburgh.
Secretary: Dr. E. R. McCluskey, Highland Bldg., Pittsburgh.
Place: Pittsburgh Academy of Medicine. Time: Second Friday, alternate months from October to April, inclusive.

Richmond Pediatric Society

President: Dr. John S. Weitzel, 3103 W. Franklin St., Richmond, Va.
Secretary-Treasurer: Dr. W. E. Chapin, 922 Floyd Ave., Richmond, Va.
Place: Retreat for the Sick, 2621 Grove Ave. Time: First Thursday of each month (other than during the summer).

Rochester Pediatric Society

President: Dr. S. W. Clausen, Strong Memorial Hospital, Rochester, N. Y.
Secretary: Dr. F. W. Bush, 29 N. Goodman St., Rochester, N. Y.
Place: Arranged by program committee. Time: Second Friday of each month from October to May.

Rocky Mountain Pediatric Society

President: Dr. C. H. Platz, Fort Collins, Colo.
Secretary: Dr. R. H. Verploeg, 1850 Gilpin St., Denver.
Place: Children's Hospital, Denver. Time: Third Saturday of each month from September to May, inclusive, 2:30 p. m.

St. Louis Pediatric Society

President: Dr. Hugh McCulloch, 325 N. Euclid Ave., St. Louis.
Secretary-Treasurer: Dr. Katherine Bain, Beaumont Bldg., St. Louis.
Place: St. Louis Medical Society. Time: Third Friday of every month.

Seattle Pediatric Society

President: Dr. C. L. Smith, 1215, 4th Ave., Seattle.
Secretary: Dr. N. W. Murphy, 515 Cobb Bldg., Seattle.
Place: College Club. Time: Third Friday of each month, 7 p. m.

Southwestern Pediatric Society

President: Dr. Donald K. Woods, 2545 4th Ave., San Diego, Calif.
Secretary: Dr. Jeanette Harrison, 1136 W. 6th St., Los Angeles.
Place: University Club of Los Angeles. Time: First Wednesday in January, March, May, September and November.

University of Michigan Pediatric and Infectious Disease Society

President: Dr. Henry G. Poncher, 5325 Kenmore Ave., Chicago.
Secretary: Dr. John P. Parsons, 320 S. Division St., Ann Arbor, Mich.
Place: Ann Arbor, Mich. Time: November, 1932.